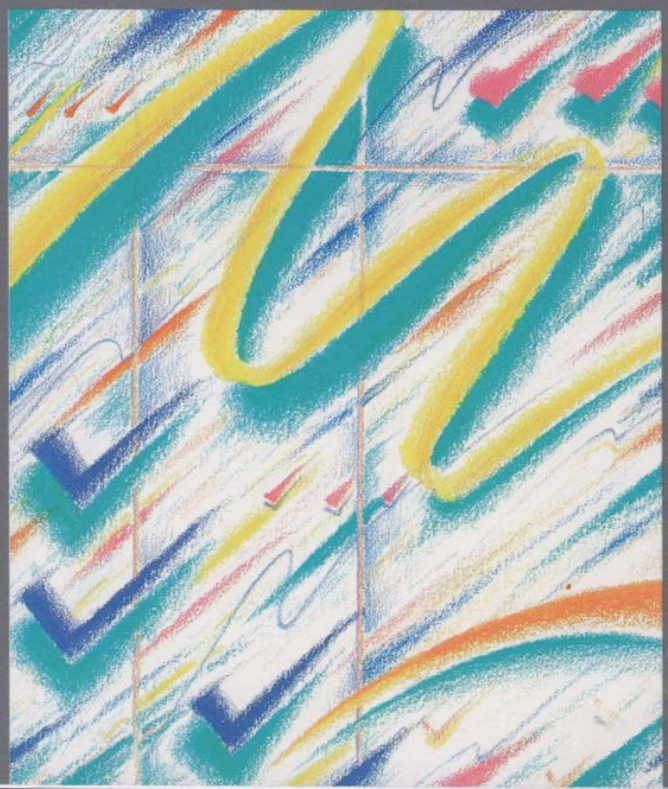
3.0

USER'S GUIDE

PARADOX®

IMMEDIATE DATABASE POWER



BORLAND

Paradox

Relational Database
Release 3.0

Paradox User's Guide

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Chapter 1

Introduction

Welcome to the *Paradox User's Guide*. This book is a comprehensive guide to Paradox, a fast, full-featured, and easy-to-use relational database management program designed to meet all of your information management needs both on your own computer and on a network.

For an overview of the capabilities of Paradox, see Chapter 1 of the *Introduction to Paradox*, a companion volume to this book.

For detailed information about designing forms, reports, and graphs, see *Presenting Paradox Data.*

- **Paradox** can be used either on a single computer or as a multiuser system on a network.
- The **Paradox LAN Pack** is a cost effective way to increase the number of authorized users on a network. To use the LAN Pack, you must have one or more copies of Paradox installed on your network. See the *Network Administrator's Guide* for details.

What's Included with Paradox

Paradox is designed for computer users with all levels of experience, from beginners to the most sophisticated. No programming is required to use Paradox—you tell the program what you want it to do by making selections from menus.

You can also extend the power of Paradox by using the **Paradox Personal Programmer**, a powerful application generator that lets you develop custom database applications without programming, and **PAL** (the Paradox Application Language), Paradox's structured programming language. Both the Paradox Personal Programmer and PAL are included in your Paradox package.

How to Use this Book

The *Paradox User's Guide* is a complete guide to the interactive use of Paradox both on your own computer and on a network. You can use it both for learning and reference:

- If you are **new** to database programs, use this book to learn about advanced features not covered in the *Introduction to Paradox*. Then go on to *Presenting Paradox Data* for tutorials on designing and printing forms, reports, and graphs.
- If you are an **experienced** database user, use this book to learn almost everything you need to know about operating Paradox. Refer to *Presenting Paradox Data* for details and tips on designing forms, reports, and graphs.
- No matter what your database experience, you can use this book for reference and to refresh your memory about options and operations.

This guide is organized around the Paradox menu system. There are 11 selections on the main menu:

View Ask Report Create Modify Image Forms Tools Scripts Help Exit

When you select one of these menu items, Paradox displays a prompt or submenu containing additional choices.

Chapters 3 through 13 of this book cover the Main menu selections. The titles of chapter subsections are usually the names of submenu selections. This organization helps you find the information you need easily and quickly. In this book, you'll find overviews of the design processes for reports, graphs, and forms. For details, refer to *Presenting Paradox Data*.

Before looking at the chapters on menu selections, make sure to read Chapter 2 (Fundamentals), which contains the basic information you must know to use Paradox. **The other chapters assume that you have read Chapter 2.**

The chapters on menu selections are followed by general references:

- Chapter 14, **Advanced Topics**, explains indexing and how Paradox uses memory. It also shows how to customize Paradox to fit your individual work style.
- Chapter 15, **Troubleshooting**, suggests what to do if something goes wrong.
- Appendix A, **Error Messages**, lists error messages you may see while using the program.

- Appendix B, **Glossary**, defines special terms used in Paradox.

Using the Sample Database

Many of the examples in this book, and in *Presenting Paradox Data*, are based on the sample *products, customer,* and *employee* tables that are included on the Paradox Sample Tables/Sample Application Disk. These tables, which are described in Chapter 2 (Data Basics) of the *Introduction to Paradox*, contain information about the fictitious Luxury Gifts department of a large department store.

The data in the examples here reflect the changes made to these tables in the tutorial contained in the *Introduction to Paradox*. This includes creating another sample table called *orders*. If you want to reproduce the examples here but skipped the tutorial, use **Scripts/Play** to play the sample *recap* script which will make the appropriate changes.

Other examples in this book are based on the Luxury Gifts Book Club, which offers several series of specialty books to the department's clientele. Information on this club is stored in three additional tables which are also included on the Sample Tables/Sample Application Disk:

- ***vols*** lists the titles offered and their list prices
- ***subgroup*** shows the series into which the volumes are divided
- ***bookord*** contains information about each book order placed by a customer.

Several other sample tables are derived from these.

The Paradox Manuals

The *Paradox User's Guide* is one in a series of six books that accompany Paradox and Paradox LAN Pack. The other volumes are

- *Introduction to Paradox*, for those who have limited experience with computers or database programs. This book is a tutorial that contains detailed examples and explanations of Paradox operations. If you are a beginning user, you should read the *Introduction* first, trying out the examples on your computer. If you are an experienced user, you may want to skim this book for a quick overview of Paradox basics.
- *Presenting Paradox Data*, which contains detailed information and tutorials on all aspects of designing graphs, reports, and forms. Refer to this book when you're ready to diplay or print your data in the way that is most effective for presentation or analysis.
- The *Guide to the Paradox Personal Programmer*, for those who want to extend the power of Paradox to develop customized applications without programming. It introduces basic application development concepts and includes a tutorial that steps you through the process of using the Personal Programmer to create an application.
- The *PAL User's Guide*, for those who want to go beyond even the substantial interactive capabilities of Paradox and the Personal Programmer. It contains a comprehensive description of the Paradox Application Language (PAL). It is specifically addressed to programmers and application developers who want to create custom single-user and multiuser database applications.
- The Paradox *Network Administrator's Guide*, for network administrators or others who will be installing and maintaining Paradox or Paradox LAN Pack on a network. It also covers network performance and resource issues and describes how to protect Paradox databases on a network.

The Paradox manuals use special typefaces to help you distinguish between keys you press, names of Paradox objects, menu selections, and entries you type. Refer to Chapter 1 (A Most Ingenious Paradox) of the *Introduction to Paradox* for a complete description of these conventions.

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Paradox and Your Computer System

Single User System Requirements

In order to use Paradox on your computer you need

- an IBM Personal System/2, PC, PC XT, XT Model 286, PC AT, or other 100% compatible computer
- one hard disk and at least one floppy disk drive
- at least 512k bytes of internal (RAM) memory
- DOS 2.0 or higher
- a compatible monochrome, color, or EGA monitor, with adapter; to display graphics you need a CGA, EGA, VGA, or Hercules card
- optionally, a compatible printer, with adapter; to print graphics, you need a graphics-capable printer
- formatted floppy disks for storing original or backup copies of the tables and other objects you create with Paradox
- optionally (to obtain even faster performance), an AST Rampage Board, Intel Above Board, or LIM 4.0 expanded memory card, or other expanded memory adapter.

Multiuser System Requirements

In order to use Paradox or Paradox LAN Pack on a computer network you need one of the following network configurations:

- a Novell network with Novell Advanced Netware version 2.0A or higher
- a 3Com 3Plus network with 3Com 3Plus operating system version 1.0 or higher
- an IBM Token Ring or PC Network with IBM PC Local Area Network Program version 1.12 or higher
- an AT&T Starlan Network with AT&T P6300 Network Program version 1.1 or higher
- A Banyan Vines version 2.10 or higher
- any other network configuration that is 100% compatible with one of the networks listed above and DOS 3.1 or higher
- one or more personal computers (see the list above) to serve as workstations. Each workstation must have
  - any combination of hard or floppy disk drives (or no disk drives at all)
  - at least 640k bytes of internal (RAM) memory
  - DOS 3.1 or higher
  - a compatible monochrome, color, or EGA monitor, with adapter; to display graphics you need a CGA, EGA, VGA, or Hercules card
  - optionally, a compatible printer, with adapter; to print graphics, you need a graphics-capable printer
  - optionally (to obtain even faster performance), an AST Rampage Board, Intel Above Board, LIM 4.0 expanded memory card, or other expanded memory adapter.

Program Capacities

In Paradox, a single table can contain up to

- 2 billion records with up to 4,000 characters each
- 255 fields with up to 255 characters per field.

Each table may have up to 15 associated forms and 15 reports.

The number of tables that can be joined in a single query is unlimited.

Installing Paradox

Before you run Paradox, it must be **installed** either on your own computer or on a computer network.

Paradox keeps track of the number of users simultaneously accessing the program from a network. The number of simultaneous users is limited to the number authorized by the Paradox license agreement for your network.

A number of different configurations are permitted under the Paradox and Paradox LAN Pack license agreements. These are

- **Standalone**: If you won't be working on a network, you can install Paradox as a standalone program on your own computer.
- **Personal workstation**: If you will sometimes be using Paradox as a standalone program and will sometimes be sharing Paradox data stored on a network, you can install Paradox on your own computer and use your copy to work with files shared through the network. This configuration does not affect the number of simultaneous users on the network.

- **Network workstation**: A copy of Paradox installed on your own computer can also be used to add to the number of users who may concurrently start the program from a network. However, in this configuration, whenever you start Paradox you will count as a network user.
- **Network configuration**: All users will access Paradox from a network and there are no copies installed on either personal or network workstations.

For more information about installation procedures and configurations refer to the *Introduction to Paradox* and the *Network Administrator's Guide*. Chapter 3 of the *Introduction to Paradox* has complete instructions for installing Paradox as a single-user program on a standalone computer. This chapter also describes how to install Paradox on your own computer so that you can access shared data on a network.

The Paradox *Network Administrator's Guide* has complete instructions for installing Paradox or Paradox LAN Pack on a network.

If you're installing Paradox on your own computer and you have a hard disk, you'll need at least 1 megabyte (1,000k bytes) of free space to install the program and run the Paradox tutorial contained in the *Introduction to Paradox*. You'll need an additional 2 megabytes free if you are installing the Paradox Personal Programmer. To allow enough room to process complex queries, we recommend maintaining at least 1 megabyte of free hard-disk space **after** Paradox and the Personal Programmer are installed. If you don't have enough space, delete some files before you begin the installation.

Starting Paradox

This section presumes that Paradox is already installed on your computer or on a network.

Starting from Your Own Computer

If you've just installed Paradox, restart (reboot) your system so that the configuration parameters established by the installation program will take effect. To do this, either turn your computer off and then on again, or press [Ctrl][Alt][Del] simultaneously to reset it.

1. Turn on your computer, or finish whatever program is already running, so that you see the DOS system prompt for your hard disk (usually **C >**) on the screen. You may have to type **c:** to change to the hard-disk drive.
2. Type **cd \paradox3** and press [Enter] to change the current directory to *\paradox3*.
3. Type **paradox3** and press [Enter].

In a few seconds you will see Paradox's title screen with the copyright notice and "signature" information you entered during the installation. You will then see the Main menu.

If Something Goes Wrong...

If Paradox does not start correctly, make sure that the program has been installed properly on your hard disk.

There are two error messages you may see:

- **Can't start Paradox: not enough memory.** On a standalone system, you need at least 512k bytes of RAM to run Paradox. Depending on your computer system, you may be able to increase available memory by reducing the size of a RAM disk or print spooler or by terminating certain memory-resident programs.

  If neither of these solutions works, you will have to add memory to your system, possibly by obtaining a Rampage Board, an Above Board, or other extended memory adapter to run Paradox.

- **Can't start Paradox: file limit in CONFIG.SYS too low.** For Paradox to run, there must be a setup file called CONFIG.SYS in the root (\ ) directory of the hard disk from which you start (boot) your computer. In most cases, the Paradox installation procedure will create or modify your CONFIG.SYS file automatically. If you see this message, then either

  - Paradox has not been installed properly; **or**

- you have not started (booted) your computer from the disk with the correct CONFIG.SYS file; **or**
- you need to read "Notes and Special Cases" in Chapter 3 of the *Introduction to Paradox*.

For more information about the CONFIG.SYS file, see Chapter 14 (Advanced Topics) in this manual.

- If any other error message appears, it will probably come from DOS. Refer to your DOS manual for more information.

If you have trouble reading information on the screen (especially the highlighted portions), or if you have an IBM color graphics card and see "snow" on the screen, you may have to tell Paradox about your monitor before you can continue. See the information about Paradox's Custom Configuration Program in Chapter 14 (Advanced Topics). This is the only reason you may need to use this program at this point.

Starting from a Network

Because each network installation is unique, there is no standard method for starting Paradox on a network. Depending upon the type of network you are using, you may

- Select **Paradox** from a menu of standard application programs available on the network
- Use a batch file to start Paradox
- Change to a designated network drive and directory and type **Paradox3**.

Contact your network administrator to find out the method that has been set up for starting Paradox on your network.

However you start it on your network, when Paradox begins, you will see the title screen containing the copyright notice.

Instead of the individualized "signature" information that appears on the title screen when Paradox is installed as a standalone program, you will see the following information relevant to your network installation:

- your company's name
- the name of your network administrator
- an indicator showing the number of people that can use Paradox simultaneously on your network and how many people were using the program when you started it.

There are several differences between running Paradox on a standalone computer and running it on a network:

- On a network you should have a special file called PARADOX3.CFG. This file, created by playing a special Paradox script called *custom*, should be set up for you by your network administrator. When you run Paradox as a standalone program from your own computer, the PARADOX3.CFG file is optional.
- To run Paradox from a network, you must have a designated private directory. The location of your private directory is stored in your PARADOX3.CFG file.
- On a network, Paradox keeps track of the number of users accessing the program simultaneously. The number of simultaneous users is limited to the number authorized by the Paradox license agreement for your network. If the number of authorized users has been reached, no additional users may sign on to Paradox until one of the current users ends his or her session.

If Something Goes Wrong...

If Paradox does not start correctly when you try to use it from your network, there are several messages you may see:

- **Can't start Paradox: total number of authorized users has been reached.** As explained above, the number of simultaneous users of Paradox on a network is limited to the number authorized by the license agreement for your network. If you see this message, it means that you will have to wait until one of the current users is finished with Paradox before you can use the program.

  If you frequently receive this message, you may want to ask your network administrator to increase the number of authorized licensed Paradox users on your network by purchasing additional copies of Paradox or by adding a Paradox LAN Pack.

- **Can't start Paradox: can't get private directory.** In order to run Paradox on a network, you must have a **private directory** which will be used to store any temporary tables you may generate during your Paradox session. The name of your private directory is usually stored in your PARADOX3.CFG file.

This message means that Paradox could not reserve a private directory for you. For details on private directories see the discussion of the **Tools/Net/SetPrivate** selection in Chapter 10 (Tools) of this manual. You may need to contact your network administrator to determine the cause and cure for this problem.

- **Can't start Paradox: invalid PARADOX3.CFG file.** This message means either that Paradox was not correctly installed on your network or that there is a problem with your DOS or network path. Consult your network administrator to determine the cause and cure for the problem.

- **Can't start Paradox; file limit in CONFIG.SYS too low.** For Paradox to run correctly, there must be a setup file called CONFIG.SYS in the directory from which you boot your computer. On a network, the boot directory may either be the root (\ ) directory of a local hard disk, or a network directory. In either case, your network administrator should have created or modified your CONFIG.SYS file with parameters appropriate to run Paradox.

  This message means either

  - **If you start from a local drive**: you have not started (booted) your computer from the disk with the correct CONFIG.SYS file, or your CONFIG.SYS file has not been properly created or modified; **or**

  - **If you boot from the network**: your workstation has not been properly configured to run Paradox.

  Contact your network administrator to determine the cause and cure for this problem.

- **Can't start Paradox: not enough memory.** To run Paradox on a network, your workstation must have at least 640k bytes of RAM. You may have to remove any memory-resident programs, RAM disk, or print spooler you've installed before you can start Paradox. Or, you may want to install additional memory in the form of a Rampage Board, an Above Board, or other extended memory adapter.

If you have trouble reading information on the screen (especially the highlighted portions), or if you have an IBM color graphics card and see "snow" on the screen, you may have to tell Paradox about your monitor before you can continue. See the information about Paradox's Custom Configuration Program in Chapter 14 (Advanced Topics).

The Keyboard

The special keys used in Paradox are labeled on the fold-out diagram. Paradox uses the IBM and Compaq Personal Computer keyboards as its standard for labeling keys. If you have another kind of computer, some of the labels may differ from those used in this book.

Paradox Function Keys

■ Blue keys pressed with Alt

Help
display help screen

Do-It!
end or perform an operation

Instant Script Record
begin or end recording instant script

Instant Script Play
play instant script

Up Image
move up one image

Down Image
move down one image

Field View
move cursor within current field

Example
enter query example

Checkmark
display column in query result

Check Plus
display all records in query result, including duplicates

Form Toggle
switch between table view and form view

Instant Repor
print report for cu

Edit
begin Edit m

Clear Image
erase current image

Clear All
erase all images

nt table

Coedit
gin Coedit mode

Menu
display menu

The Main Keyboard

■ Blue keys pressed with Alt

■ Black keys pressed with Ctrl

Next field

Previous field
(pressed with Shift)

Used (like Shift) to modify effect of other keys

"Turbo" key; used (like Shift) to modify or increase effect of other keys

■ **Zoom**
quickly locate first occurence of a value in a table

■ **Zoom Next**
quickly locate next occurence of Zoom value in a table

■ **Ditto**
repeat field from previous record

■ **Field Vie**
move cursor field (same

■ **Ve**
displa
repor

■ **Rotate**
rotate fields to right of cursor

■ **Refresh**
update screen with change made by other network us

■ **Rep**
delete line in

t **Delete Line**
m cursor to end of
ort specification

■ **Undo**
undo changes made during editing session

■ **DOS Big**
temporarily suspend Paradox and return to DOS with extra memory available

■ **DOS**
temporarily suspend Paradox and return to DOS

Erase current field

Erase character to left of cursor

Return to previous menu, or from menu to workspace

Switch keypad between numeric and cursor modes

■ **Stop current task**, ret
to previous operation

cal **Ruler Toggle**
r hide line count in
enerator or script editor

thin current
Alt F5)

■ **Key Viol**
view records with conflicting values in key fields

■ **Lock Toggle**
lock or unlock a record

Select option, end operation, move to next field, or insert line in report specification or script

Paradox Numeric Keypad

NUMERIC KEYPAD ON MENUS

■ Black keys pressed with Ctrl

First selection

One selection left

■ **Screenful of selections left**

Last selection

One selection right

■ **Screenful of selections right**

Function Keys

The ten **function keys** at the top or far left side of the keyboard let you obtain help, issue immediate commands, and display menus. In addition, you can perform several special functions by holding down [Alt] or [Ctrl] while you press a function key.

Numeric Keypad

The numeric keypad is located at the far right side of the keyboard. In **cursor mode**, the numeric keys let you make menu selections, move the cursor (pointer) around the screen, and insert and delete records and characters. The effect of these keys in menus is shown in the facing foldout diagram. Other effects, depending on whether you are working in table view, form view, or field view or editing a form, report, or script, are shown on the following pages.

The effect of several of these keys can be enhanced by pressing them while you hold down [Ctrl].

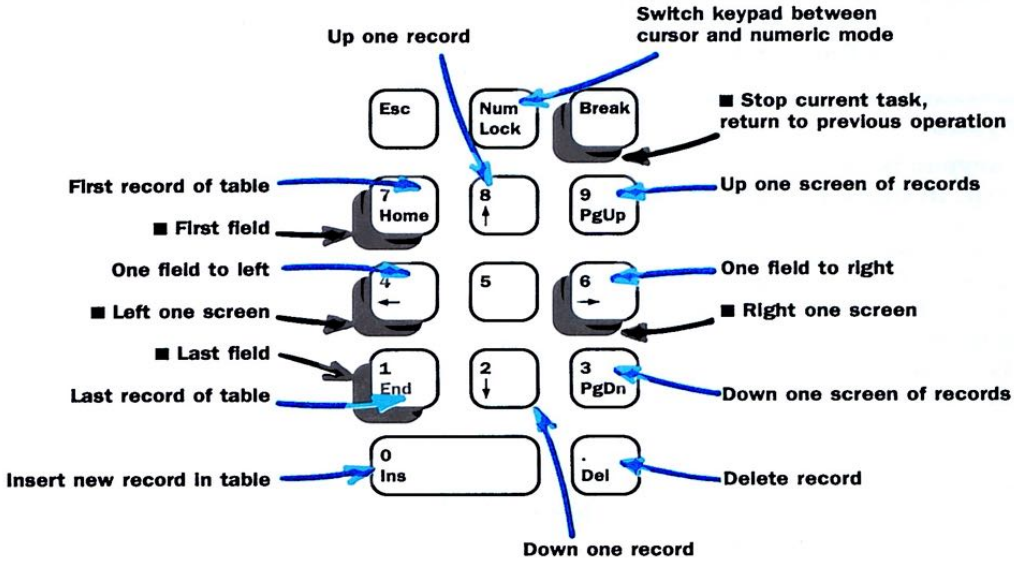
In **numeric mode**, the numeric keys let you type numbers. You can press [NumLock] to toggle (switch) from cursor to numeric mode and back.

Main Keyboard

In combination with [Alt] or [Ctrl], letters on the main keyboard are used as shortcuts for menu selections and to perform other functions. The fold-out diagram shows these special key combinations.

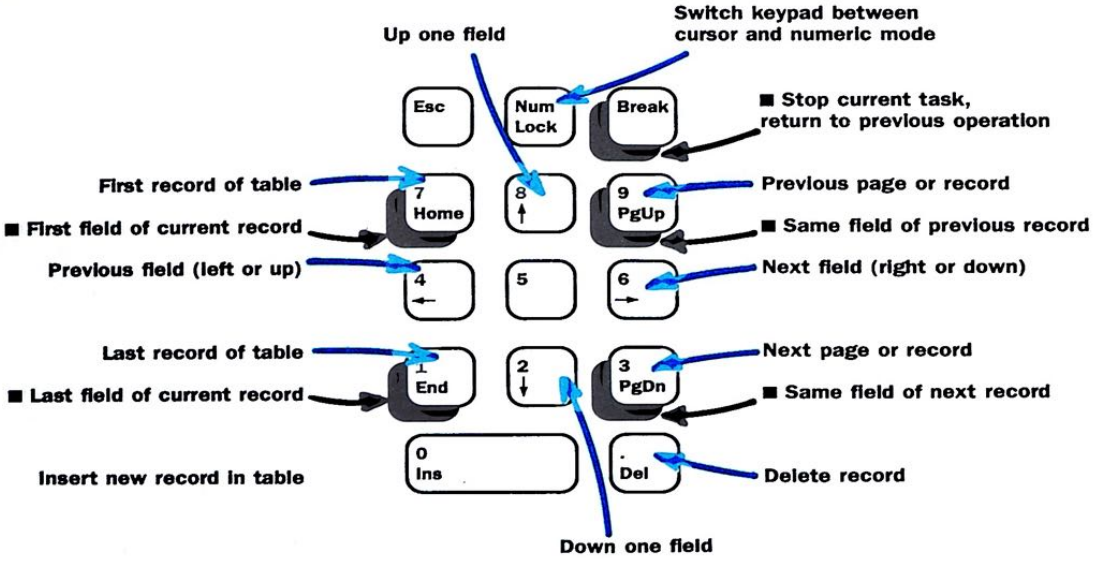
NUMERIC KEYPAD IN TABLE VIEW

■ Black keys
pressed with Ctrl



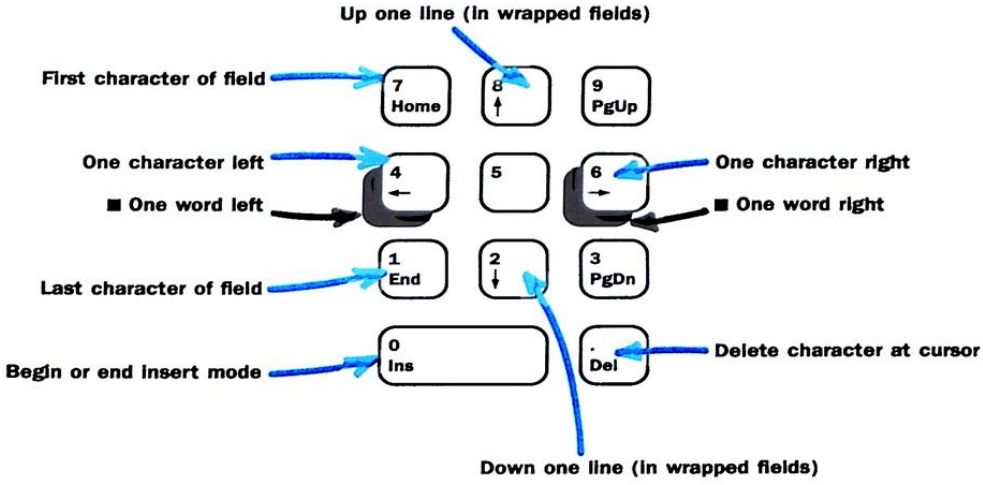
NUMERIC KEYPAD IN FORM VIEW

■ Black keys
pressed with Ctrl



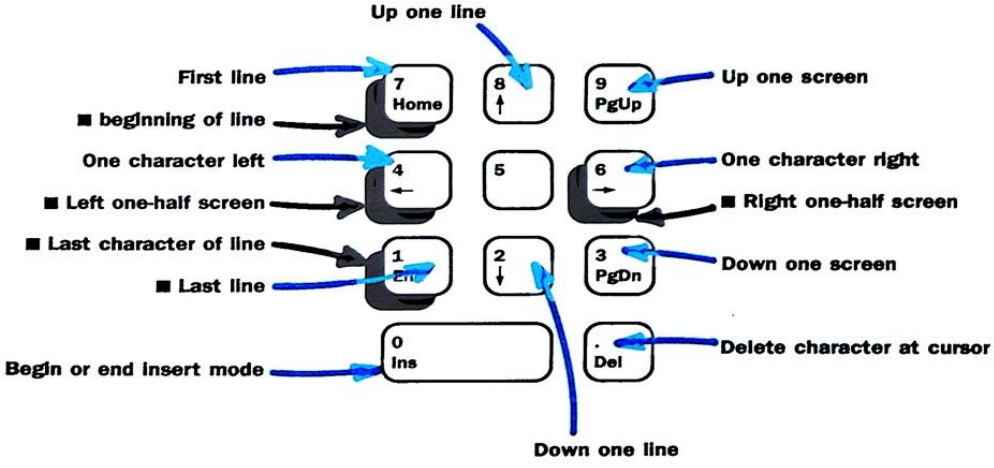
NUMERIC KEYPAD IN FIELD VIEW

■ Black keys pressed with Ctrl



NUMERIC KEYPAD IN FORM/REPORT/SCRIPT EDITOR

■ Black keys pressed with Ctrl



The Screen

Areas

Paradox's screen is divided into two parts:

- the **menu area** at the top, menu choices and status messages
- the **workspace** below the menu, tables and forms (images).

In addition, messages are sometimes displayed in a **window** that appears at the bottom of the screen.

Cursor

Within an image, the **cursor** (pointer) always points to the field or character you are currently working on. It may be a blinking underline or a solid square; it changes shape depending on what you are doing.

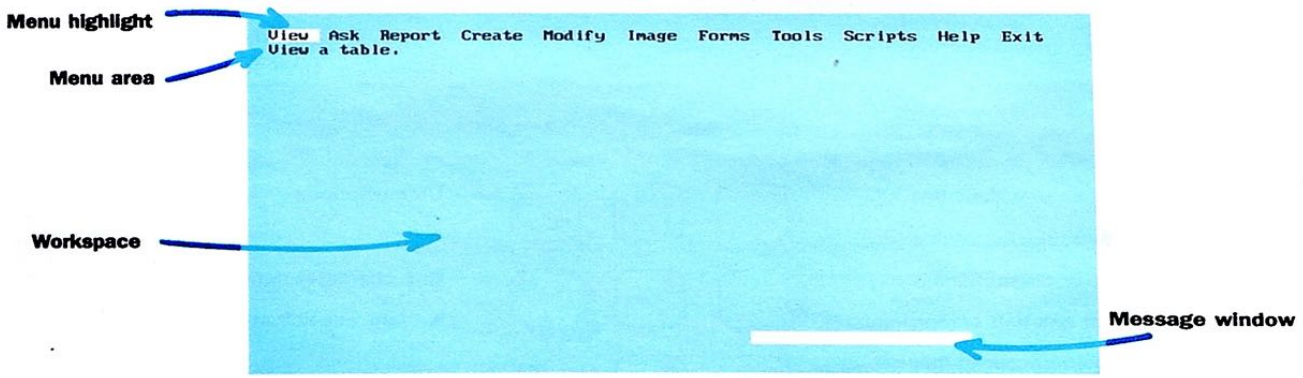
The entry, table, record, or field in which the cursor is located is called the **current** entry, table, record, or field.

Status Messages

Status messages at the top of the screen help you keep track of what you're doing. For example, if you are viewing a table, the message will tell you where you are:

Viewing Orders table: Record 4 of 22

Similarly, a highlighted **mode indicator** at the top right of the screen tells you whether you are in the main part of the program, editing, creating a table, or designing a form or report.



Display Conventions

Certain display conventions help you know exactly where you are in an image:

- Since large tables cannot all fit on the screen at one time, the screen serves as a **window** on the table.

  The right edge of a table is indicated by a **double line**. The left edge contains the **record numbers** in ascending order.

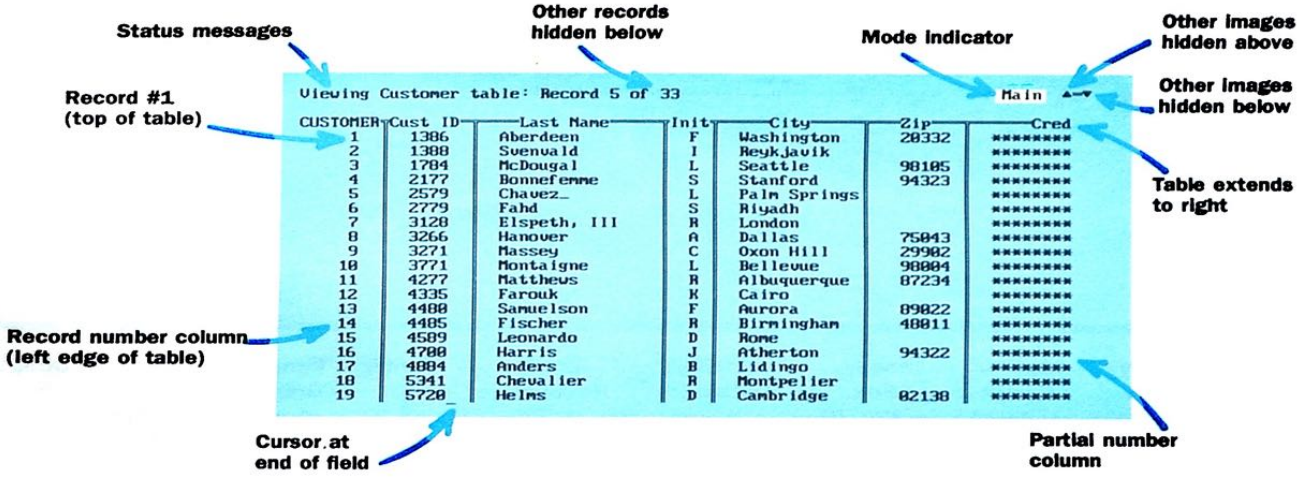
  Your vertical position in a table is indicated by the **record count** at the top of the screen.

- If there are more images on the workspace than can be viewed at one time, you will see a small **arrow** in the top right corner pointing toward the hidden images.

- If a number field must be partially hidden at the right edge of the screen, Paradox will not cut it off before the decimal point. Instead, the values will appear as **asterisks** (***). When the table scrolls so that the whole field can be displayed, you will see the numbers.

- In certain cases, a value may be longer than its field display width. If so, the cursor will appear at the **beginning** of the field instead of at the end. For information about how such values are displayed, see "Viewing Values That Don't Fit" in Chapter 3 (View).

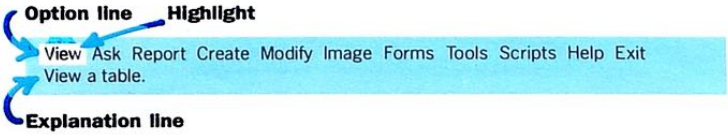
Display Conventions



Paradox Menus and Prompts

In large part, you tell Paradox what to do by selecting choices from a menu at the top of the screen. Paradox menus are organized in a top-down, hierarchical fashion. At the top of the hierarchy is the **Main menu**; most of its selections contain sub-menus of their own, and so on. You narrow the range of choices until you have arrived at the specific choice you want to make.

The options on the Main menu reflect Paradox's major operations.

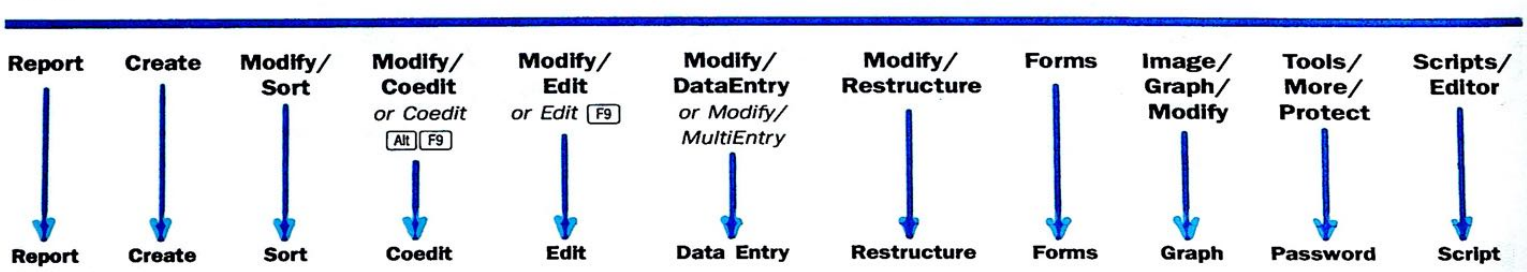


The Structure of Paradox

The selections on Paradox's Main menu reflect the program's structure. At the top is the **Main** mode of the program, which includes the Main menu and the **View**, **Ask**, **Image**, **Tools**, **Scripts**, **Help**, and **Exit** selections. Other Main menu selections let you enter the eleven lower-level modes. The complete structure is shown in the diagram below.

Each mode is self-contained and has its own menu. The mode indicator in the top right corner of the screen always tells which mode you're in at the moment. To get back from a lower mode to Main mode, you must first end your work in the lower mode by pressing Do-It! [F2] or by selecting **DO-IT!** or **Cancel** from the menu.

Modes



Displaying Menus

The menu that appears at the top of the screen always reflects the choices available to you at the moment. The Main menu is always displayed when you start Paradox. Other menus appear when you make selections from the Main menu or press Menu [F10]. While you are involved in operations on the workspace, the current menu will disappear.

Pressing Menu [F10] at any time will display the current menu. You can press [Esc] to return to the workspace, or to the previous menu if you are looking at a submenu.

Moving Around in the Menu

On all menus, the choices are arranged across the top. The **current selection** is highlighted. You can use [→] and [←] to move the highlight from one option to another on the menu. You can also use [Home] to move to the beginning of the menu, and [End] to move to the end of the menu.

Below the menu choices is an explanation of the highlighted option. As you move to other options, the explanation changes.

The Paradox Menu

View

View a table

Ask

Get a query form to ask questions about a table.

Report

Output, design, or change a report specification.

- **Output**
- **Design**
  - **Tabular**
    - **Field**
    - **TableBand**
    - **Group**
    - **Output**
    - **Setting**
    - **Help**
    - **DO-IT!**
    - **Cancel**
  - **Free-form**
    - **Field**
    - **Group**
    - **Output**
    - **Setting**
    - **Help**
    - **DO-IT!**
    - **Cancel**
- **Change**
- **RangeOutput**
- **SetPrinter**

Create

Create a new table structure.

- **Borrow**
- **Help**
- **DO-IT!**
- **Cancel**

Modify

Sort or edit a table, enter new records, or restructure a table.

- **Sort**
- **Edit**
- **Coedit**
- **DataEntry**
- **MultiEntry**
- **Restructure**

Image

Resize or reformat an image, move to a field or record, select a form.

- TableSize
- ColumnSize
- Format
- Zoom
- Move
- PickForm
- KeepSettings
- Graph

Forms

Design or change a form.

- Design
  - Field
  - Area
  - Border
  - Page
  - Style
- Multi
  - Help
  - DO-IT!
  - Cancel
- Change

Tools

Rename, speedup queries, convert data, delete, info, more.

- Rename
- QuerySpeedup
- ExportImport
- Copy
- Delete
- Info
- Net
- More
  - Add
  - MultiAdd
- FormAdd
  - Subtract
  - Empty
  - Protect
  - Directory
  - ToDOS

Scripts

Play or record a script.

- Play
- BeginRecord
- QuerySave
- ShowPlay
- RepeatPlay
- Editor

Help

Help with using Paradox.

Exit

Leave Paradox (all changes have been saved for you).

- No
- Yes

Making Selections

There are two ways to choose an option from a menu:

- **highlight** the option and press [Enter], **or**
- press the **first letter** of the option you want.

Once you've selected a menu option, the next step will be one of the following:

- you will begin the action you've selected
- you will see a submenu from which you'll make further choices
- you will be asked to respond to a prompt for the name of a table or script
- you will be asked to point to something on the screen, **or**
- you will be prompted to type in a description, a calculation, or an expression.

Responding to Prompts

When you make certain menu choices, Paradox will prompt you for the name of a table, script, or file. For instance, if you select **View** from the Main menu, you will see

```
Table:
Enter name of table to view, or press, ↵ to see a list of tables.
```

There are three ways you can respond:

- Type the table, script, or file **name** and press [Enter].
- Press [Enter] to display a **menu** of all the tables, scripts, or files in the current working drive and directory. Then select the one you want from the menu. If there is more than a screenful of menu choices, you may scroll through them one screen at a time. Press [↑] or [Ctrl][→] to scroll right and [↓] or [Ctrl][←] to scroll left.

  If you make your menu selection by typing the first letter of the name, and more than one table, script, or file name begins with the letter you pressed, the names beginning with other letters will disappear from the menu. You must then highlight the object you want and press [Enter].
- Press [Esc] to **return** from the prompt to the previous menu.

For information about using tables, scripts, and files in other than the current working drive or directory, see "Paradox Objects" later in this chapter.

Pointing and Sizing

When you make some menu choices, Paradox will ask you to use the cursor keys to point to a table, field, or other item on the screen. You may also be asked to use the cursor to resize an item. During these operations, the [Enter] key is used to tell Paradox when you are done.

For example, if you select **Image/ColumnSize** to resize a field on the screen, Paradox will prompt:

```
Use → and ← to move to the column you want to resize...
then press ↵ to select it...
```

When you've moved the cursor to the field you want, press [Enter]. Then Paradox will prompt:

```
Now use → to increase column width, ← to decrease...
press ↵ when finished.
```

As you press [→] and [←], you will see the field expand or shrink. Again, press [Enter] when you're done.

Typing in the Menu

For certain menu choices, Paradox will ask you to enter or edit a description, an expression, or a formula. For example, when you begin to design a report, Paradox will prompt:

```
Report Description:
Enter report description
```

At this point, you can enter a description for the report.

The length of the line you can type varies with its purpose. For instance, descriptions for form and reports are limited to 40 characters, while formulas for calculated fields may be up to 175 characters. If your typing exceeds the width of the screen, the expression you type will scroll in the menu.

Whatever you type will appear in the menu line. You can use the regular Edit mode in which you edit from the end of the line or you can press Field View [Alt][F5] or [Ctrl][F] to edit within the line. Field view is especially useful when you are working with long expressions (see "Editing Using Field View" later in this chapter).

At any time when typing in the menu, you can press [Ctrl][Backspace] to remove the entire value you've been entering or editing.

The Menu and the Workspace

At a given moment, you are working **either** in the menu or on the workspace. When you complete a set of menu choices, the cursor will appear on the workspace and the menu will disappear.

Pressing Menu [F10] at any time will display the current menu. At that point, the keys you press apply to the menu, not the workspace. You can complete the menu choices, or press [Esc] to return to previous menus and eventually to the workspace.

Cancelling an Operation

If you begin to carry out an operation and change your mind about doing so, you can cancel the operation in one of four ways:

Esc **Back out**

Press [Esc] to **back you out** of menus and prompts, and return you to the workspace or previous menu.

Ctrl **Break** **Interrupt**

Press [Ctrl][Break] to **interrupt** the current operation and return to whatever you were doing before you began it.

Cancel

Select **Cancel**. For some operations in the lower-level modes, selecting **Cancel** from the current menu stops the operation, undoes any changes you have made, and returns to what you were doing before you began the operation.

Ctrl **U** **Undo**

While editing or entering data, you can press Undo [Ctrl][U] or select **Undo** from the menu to undo your edits or entries. For details, see Chapter 7 (Modify).

Help

You can view a Paradox help screen at any time by pressing Help [F1]. The help screens are context sensitive, displaying information about whatever you are doing at the moment.

[F1] **Help**

In addition, you can use Paradox's **help index** to assist you in locating help about a particular topic. To access the help index, press Help [F1] while you are viewing any help screen.

To leave Help and return to where you were with Paradox, press Do-It! [F2] or select **Paradox** from the Help menu, or press [Esc] from within the help index.

For information about using the Paradox help screens, see Chapter 10 of this manual.

Beeps

Paradox's most common response to an unexpected event is a simple **beep**. A low-pitched beep indicates that you have tried to move the cursor beyond a boundary, such as the last row of a table.

A high-pitched beep indicates that you have tried to give an inappropriate command or made an inappropriate entry, like entering a dollar amount in a date field.

A third kind of beep you may hear is not specific to Paradox. It is your computer's signal that it can't keep up with all the characters you have typed. On most (though not all) computers, this sound will be a very high-pitched, short tone.

Error Messages

When a situation needs an explicit explanation, Paradox will display a **message** in the message window at the bottom of the screen. If you need more information about what the message means, see Appendix A of this manual.

Editing

A table or form on the screen is called an **image** because it reflects the actual information stored on your disk. You can edit the information in any image.

Images of tables and forms are protected from accidental typing and inadvertent changes. When you want to change the information they contain, you enter **Edit mode**. If you are working on a network and two or more people need to edit a single table at the same time, you can use Paradox's special **Coedit mode**.

Keys used for editing an image are shown on the fold-out key diagram earlier in this chapter, and the process of editing or coediting a table is explained in Chapter 7 (Modify) of this manual. Making changes to a query form is the same as editing a table, except that you do not have to enter a special edit mode.

Editing Using Field View

In normal editing of tables and of values entered in response to prompts, you make changes from the end of an entry.

You can also press Field View [Alt][F5] or [Ctrl][F] to access field editing, which allows you to move the cursor around within an entry. The cursor changes from an underline to an underline within a small box, indicating that you are in field view. Keys used in editing with field view are shown on the keyboard diagram earlier in this chapter.

When editing with field view, you can press [Ins] to toggle (switch) between insert and replace mode. In insert mode, the underline remains within the box and newly typed characters are inserted there, moving existing characters or spaces to the right. In replace mode, the underline disappears from within the box and newly typed characters replace existing characters.

Tables 2-1 and 2-2 show the effects of keys in normal edit, coedit, and field editing, and in normal and field editing in the menu line.

When you are finished editing with field view, press [Enter] to accept the changes you've made. You will return to the mode you were in before you started field view.

Table 2-1. Field Editing Compared with Normal Edit and Coedit

Key	Effect in Field Editing	Effect in Normal Edit and Coedit
[←], [→]	move from character to character within field	move from field to field
[Home], [End]	move to beginning and end of field	move to beginning and end of table
[Del]	deletes character at cursor	deletes entire record
[Ins]	toggles between insert and replace modes	inserts new record
[ ]	characters you type are inserted at cursor (insert mode) or replace existing characters (replace mode)	characters you type are added at end of entry
[Backspace]	deletes character to left of cursor	deletes last character of entry
[Ctrl][Backspace]	deletes entire field	deletes entire field
[Enter]	ends field view	moves to next field
[↑], [↓]	moves from line to line in wrapped field in forms	moves from record to record (in table view)
[Ctrl][←], [Ctrl][→]	moves from word to word within field	one screen left or right in table view (no effect in form view)

Table 2-2. Field Editing Compared with Regular Typing in the Menu Line

Key	Effect in Field Editing in the Menu	Effect in Regular Typing in the Menu
[←], [→]	move from character to character within value	have no effect
[Ctrl][←], [Ctrl][→]	move from word to word	have no effect
[Home], [End]	move to beginning and end of value	have no effect
[Del]	deletes character at cursor	has no effect
[Ins]	toggles between insert and overwrite modes	has no effect
[ ]	characters you type are inserted at cursor (insert mode) or replace existing characters (replace mode)	characters you type are added at end of value
[Backspace]	deletes character to left of cursor	deletes last character of value
[Ctrl][Backspace]	deletes entire value	deletes entire value
[Enter]	ends field view	accepts value, moves to next submenu or action

Field View with Wrapped Fields

In custom forms, you may wrap values in a single field onto multiple lines. When you are editing a value in a wrapped field, field view is especially useful as it allows you to use the [↑] and [↓] keys to move among lines of the field.

When you are editing a wrapped field, Paradox tries to maintain word-wrapping (breaking lines only at spaces or hyphens). However, if the field value becomes longer than the display width, Paradox will resort to character-wrapping, putting as many characters as will fit on each line. When you end field view, the value will be word-wrapped.

Editing Forms, Reports, and Scripts

When you are designing or changing a Paradox form or report, or when you are editing a script or PAL program, you use Paradox's **full-screen editor**. The cursor keys move the cursor from character to character, or to the beginning or end of lines or screens as shown in the fold-out key diagram.

You can press [Ins] to toggle (switch) between **insert** and **replace mode**. In insert mode, the characters you type are inserted in front of other characters at the cursor. In replace mode, you type new characters over those already there. An indicator at the top right corner of the screen tells you whether you are in insert mode or not.

Finally, you can use several special keys while editing report formats and scripts:

[↵] **Enter**

[Enter] inserts new line (insert mode only)

[Ctrl][Y] **Report Delete Line**

Report Delete Line [Ctrl][Y] deletes from cursor to end of line

[Ctrl][V] **Vertical Ruler Toggle**

Vertical Ruler Toggle [Ctrl][V] displays or hides line count.

Paradox Objects

Each Paradox table may have other **objects** associated with it, such as forms, report formats, and indexes. A table and all the other objects associated with it are called a **family**.

While each object is stored in a file on your disk, objects are not the same as files: they have special characteristics that make them easier to work with. For example, when you use Paradox, you don't have to worry about file extensions. Paradox always knows (or will ask) what kind of object you are talking about. Also, when you use **Tools/Copy** to copy a table, Paradox will automatically copy the rest of the family as well.

On disk, all the objects in a family have the same **base name** as the table, and are distinguished from each other by their filename **extensions**:

Extension	Type of Object
.DB	table
.F or .F**	form
.G	graph specification
.R or .R**	report format
.SET	image settings
.VAL	validity checks
.PX	primary index
.X**	query-speedup (secondary index)
.Y**	query-speedup (secondary index)

The * in a form, report format, or query-speedup extension stands for a single digit.

Scripts are distinguished by the file extension .SC, for *script*, while graph settings are distinguished by .GRF. Neither of these is part of a family.

To copy the objects associated with one table to another table, you can use the **Tools/Copy/Just-Family** selection. This is very helpful when you have used a query to extract a subset of records in a table and would like to copy a predefined report or form to the resulting *answer* table.

Naming Objects

Tables and Scripts

The names of Paradox tables and scripts follow standard DOS conventions. The names you choose for these objects

- can be up to **8 characters** in length, with no extensions
- can contain **letters**, **numbers**, and **special characters** like $ and _ as described in the DOS manual
- cannot contain **spaces**

- cannot **duplicate** the name of another object of the same type
- should not include characters in the IBM **extended** character set
- should **describe** the contents of the table or script (to help you remember what's in it).

Fields

The names of fields in a table

- can be up to **25 characters** in length
- must not **start** with a blank space, but can **contain spaces**
- can contain any printable character **except** double quotes ", square brackets [ ], braces { }, number signs # by themselves, left or right parentheses ( ), and the combination – >
- cannot **duplicate** the name of another field in the same table (adding blank spaces at the end will not distinguish them)
- should **describe** the contents of the field.

Forms and Reports

Forms for a table are identified either by the letter **F** alone, or by one or two digits from 1-14. The **F** form (called the preferred form) is the one displayed when you press Form Toggle [F7], unless you use **Image/PickForm** to select another. The **F** form will be Paradox's **standard form** unless you have modified it. See Chapter 9 (Forms) and Chapter 2 (Designing Forms) of *Presenting Paradox Data* for more on the standard form.

Similarly, reports for a table are identified either by the letter **R** or by one or two digits, 1-14. Unless you are currently designing a report, the **R** (or preferred) report is printed when you press Instant Report [Alt][F7].

When you design or change a form or report format, you can provide a comment or description for it. Since this comment appears on menus, it will help you identify the form or report you want. You can enter a description of up to 40 characters.

Field Types

The **field type** determines what kind of information a field can contain. There are five choices: **A**, **N**, **$**, **D**, and **S**.

A **Alphanumeric** fields can contain letters, numbers, special symbols (like +, –, %, $, and &), and any other Ascii character (except null). When you create an alphanumeric field, you must specify its length from 1 to 255 characters.

N **Number** fields can contain numbers of up to 15 significant digits (including decimal places) from $\pm 10^{-307}$ to $\pm 10^{308}$. Values with more than 15 significant digits will be rounded and stored in scientific notation.

As described in Chapters 7 (Modify) and 8 (Image), you can choose among many ways of entering and displaying numbers in Paradox, but that does not affect the way the numbers are stored. For example, suppose a field contains the value 23.45678. If you use **Image/Format** to display it with two decimal places, the entire number will still be stored in the table. If you later reformat the field to 5 or more decimal places, you will see the full number.

Here's how Paradox stores the numbers you enter:

Entered Value	Stored Value
123	123
–101.002345678901	–101.002345678901
1,000,000,000,000.00001	1.E12
3,456.34	3456.34
0.12345678912345 67	1.23456789123456E-01

Note that data and display conventions may not be used on query forms. For example, if you want to select records with a balance due of –1234.56, you must type **–1234.56** on the form, not **–1,234.56**, **(1234.56)**, or **–1234**.

$ **Currency** fields are exactly like number fields, but by default their display format

- is rounded to 2 decimal places
- always includes **whole number separators**
- places negative numbers in **parentheses**.

(**N** fields—unless you reformat them—are displayed without whole number separators and with decimal places only if needed. Negative numbers are preceded by a minus sign.)

D **Date** fields can contain any valid date between January 1, 100 and December 31, 9999. On screen, you may enter or display date values in the form **mm/dd/yy** or **dd-Mon-yy** or **dd.mm.yy.** For dates not in the 20th century, you may add the century (**yyy** or **yyyy**).

Thus the year component of a date value may be 2, 3, or 4 digits. Some examples will show how Paradox displays dates in each format:

Date	mm/dd/yy	dd-Mon-yy	dd.mm.yy
July 1, 1099	7/01/1099	1-Jul-1099	1.07.1099
May 1, 213	5/1/213	1-May-213	1.05.213
April 21, 1988	4/21/88	21-Apr-88	21.04.88

There are eight additional formats you can use when printing dates in Paradox reports. See Chapter 4 (Designing Tabular Reports) of Presenting Paradox Data for more information about these formats.

Paradox dates are based on the Gregorian calendar currently in use. For dates before the 16th century (when the Gregorian calendar was adopted in its present form), the Gregorian conventions are extrapolated.

Paradox knows about leap years and leap centuries and checks all dates for validity. You'll see an error message if you try to enter an invalid date like 2/29/87.

Paradox knows how to sort dates and do arithmetic with them. In queries, you can calculate the number of days between two dates, or the date that results when you add days to (or subtract them from) another date. The Paradox Application Language (PAL) contains additional functions to handle dates.

S **Short Number** fields should only be used by advanced Paradox users and application developers. These are special number fields that can contain only integers (whole numbers) between –32,767 and 32,767.

In addition to their limited range, no data entry or display formatting options are available for **S** fields. Their sole advantage is that they take less disk storage space than **N** fields, which makes them useful in large tables when space considerations are important.

Temporary Tables

Certain Paradox operations create temporary tables which last only until they are overwritten by another temporary table with the same name, or until you end the current Paradox session.

Paradox temporary tables are also deleted when you use the **Tools/More/Directory** option to change the working directory, and also when you use the **Tools/Net/SetPrivate** option to change your private directory on a network.

Paradox's temporary tables are listed and described below. Several of them allow you to undo changes to your database, and to deal with problems encountered while adding or editing records. Until a temporary table is overwritten or erased, you can edit and query it as you would any other Paradox

Table 2-3. Paradox Temporary Tables

Name	Contains	Created During
answer	results from a query	Ask
changed	unchanged copy of changed records	Ask (changeto) *or* Tools/More/Add *or* Tools/More/MultiAdd
crosstab	results of a crosstab	Graph
deleted	deleted records	Ask (delete)
entry	new records for a table	Modify/DataEntry *or* Modify/MultiEntry
family	reports and forms for a table	Tools/Info/Family
inserted	inserted records	Ask (insert)
keyviol	records with duplicate key values	Modify/Restructure *or* Modify/DataEntry *or* Modify/MultiEntry *or* Tools/More/Add *or* Tools/More/MultiAdd
list	list of tables, scripts, and files in specified directory list of current Paradox users on a network list of locks currently applied to a table and its family	Tools/Info/Inventory Tools/Info/Who Tools/Info/Lock
password	auxiliary passwords	Tools/More/Protect/Password/Table
problems	unconverted records	Tools/ExportImport/Import *or* Modify/Restructure
struct	table definition	Create, Modify/Restructure *or* Tools/Info/Structure

table. *If you want to save one of these tables, just use the* **Tools/Rename** *selection to rename it.*

In order to help you prevent accidental loss of data, Paradox will warn you when you are performing an operation where a temporary *problems* or *keyviol* table may be overwritten.

Disks, Drives, and Directories

When Paradox retrieves or stores files on disk, it normally goes to your **working drive and directory**. This is either

- the drive/directory you were in when you **started** Paradox (the DOS-connected directory), **or**
- the drive/directory specified by you as a **default** in Paradox Custom Configuration Program (CCP), **or**
- the drive you've **changed** to during a Paradox session by using the **Tools/More/Directory** selection of the Main menu

However, you may work with objects in any drive and directory. When Paradox prompts you for a table, script, or file name, precede the name with its drive and/or directory. For example, if you are currently in the *\paradox3* directory on drive C but you want to display a table called *staff* from a directory called *\pers\records* on drive A, enter

```
Table:  a:\pers\records\staff
Enter name of table to view, or press ↵ to see a list of tables.
```

instead of just **staff**.

If you would rather select the name from a menu, enter the drive and/or directory name before pressing [Enter]. For example,

Table: a:\pers\records

will list all the tables in the *\pers\records* directory on drive A, while **Table: a:** will list all the tables in the current directory on drive A.

You can also use **Tools/More/Directory** (see Chapter 10) to change the current drive and directory.

- **Important:** *Before removing any floppy disk containing Paradox data, press Clear All* [Alt][F8].

DOS Drive-Not-Ready Errors

Although Paradox has extensive resource and error checking capabilities, the DOS message

```
Not ready error reading drive A
Abort, Retry, Ignore?
```

may sometimes sneak through during a Paradox session. If this ever happens, you should always select the **Retry** option first. This option will in most cases prevent any potential data loss that could occur in such a situation.

Using Write-Protected Disks

Performing any operation which requires Paradox to record data on a floppy disk will cause the program to exit to DOS if the disk is write-protected. Please make sure that none of your Paradox data disks are write-protected before you insert them into your computer during a Paradox session.

Using Paradox on a Network

The following section provides an overview of the major multiuser features of Paradox. Most of these features are discussed in more detail later in this manual, in the *PAL User's Guide*, and in the Paradox *Network Administrator's Guide*. If you will be using Paradox only as a standalone program and not as part of a network, you can skip this section.

General Concepts

Using Paradox on a network is almost exactly like using it as a standalone program on your own computer; in either case, you have the same ability to "get your hands on" your data. The main difference is that on a network you will often be sharing tables, forms, and reports with other users. Many times, two or more users will be working with the same tables simultaneously.

When you use Paradox on a network:

- Paradox automatically **locks** tables, forms, reports, and other objects when necessary to ensure data integrity and consistency. If you need to use a table or other object that has been locked, Paradox will tell you the name of the user who has locked it.
- Paradox's special **Coedit mode** lets two or more users edit a table simultaneously. Each record is automatically locked as it is being edited and unlocked when changes have been made.
- Paradox lets you **instantly see** changes made by other users to tables you're working with.
- Each user can use **explicit locks** and other protection features that supplement Paradox's automatic locking capabilities. These features let you maintain complete control over other users' access to tables you are sharing through the network. This is particularly useful for custom applications.
- You can choose among multiple printers on the network simply by making a menu selection.
- For programmers and application developers, PAL (the Paradox Application Language) and the Paradox Personal Programmer contain a full range of tools to build multiuser applications. These tools are designed to guarantee that applications avoid network deadlock. For more on multiuser programming, see the *PAL User's Guide* and the *Guide to the Paradox Personal Programmer*.

Access to Paradox Objects

As a result of the automatic and explicit locking of shared tables, you may sometimes be unable to obtain a table, form, or report you need to work with because it is already being used by another user for an operation that does not allow simultaneous access. When this happens, Paradox will tell you who has locked the table.

Paradox's **Tools/More/Protect** option lets you restrict other users' access to tables, forms, and reports. You can even use this feature to restrict access to specific fields of a table.

On the other hand, if you are working with a table or other object protected by another user, you may sometimes have access to it without being able to change or view all of its information. In some instances, you may not even be able to view the object at all.

Network Citizenship

Problems can sometimes arise when several people need to use the same object at the same time. Paradox helps to promote good network citizenship by giving each individual user the widest possible access to data while respecting the rights of all other users also trying to use the same information.

Paradox manages shared resources so that everyone can work as effectively and efficiently as possible in the network environment. Although Paradox does this automatically, you always have the option of explicitly controlling how the multiuser features are applied.

Sharing Tables

There is nothing special you need to do to share tables with other Paradox users on your network. The only requirement is that the tables are in a **shared directory**. The process of setting up shared directories varies from network to network and is usually handled by the network administrator.

If Paradox has been installed on your network as recommended in the *Network Administrator's Guide*, there will be at least one shared directory called *\pdoxdata* that contains the Paradox sample tables and scripts. Contact your network administrator for information about how to locate the *\pdoxdata* directory and how to create other shared directories.

Locking Objects

Paradox automatically manages shared tables, forms, and reports on a network to maintain

- **Data integrity**: To protect data from damage or corruption when two or more users are working simultaneously with the same table.
- **Data consistency**: To ensure that all users are viewing a single, correct version of each table.

Paradox does this by selectively **locking** any shared object that users are working with.

Locks temporarily restrict other users from accessing a table, form, or report while you are using it. Paradox always provides the maximum degree of concurrent access consistent with the prevention of corruption and loss of data. In decreasing order of restriction on concurrent use, the locks are:

- **Full lock**: To give you complete access to a table or other object, while preventing all other users from accessing it for any reason. Thus, full locks preclude concurrent access to the locked object.
- **Write lock**: To let other users access a table or other object you are using, but not change its structure or contents.
- **Prevent write lock**: To prevent other users from placing either a full or write lock on an object. Prevent write locks guarantee that other users will not be able to block you from carrying out any operation that requires you to modify an object.
- **Prevent full lock**: To prevent other users from placing a full lock on an object. Prevent full locks provide the maximum level of concurrent use of an object. Other users may perform operations that place and prevent write locks on an object on which a prevent full lock has been placed.

The third and fourth locks are really restrictions on the ability to place the first two.

Table 2-4. Locks that May Coexist for a Single Object

	Full lock	Write lock	Prevent write lock	Prevent full lock
Full lock				
Write lock		√		√
Prevent write lock			√	√
Prevent full lock		√	√	√

Paradox also has three more kinds of locks: **family locks**, **record locks** and **form locks**. A family lock is automatically placed on all of the family members of a table that is being copied using the **Tools/Copy/Table** or **Tools/Copy/JustFamily** menu selections. A family lock allows the same level of concurrency as a write lock. Record locks are placed on individual records in a table while it is being coedited. See "Record Locks" later in this section for details.

It is important to remember that the locks that Paradox automatically places on your behalf never restrict what **you** can do with an object, only what **others** can do. Of course, if other users are performing operations that lock an object, those locks restrict what you can do.

There is no limit to the number of locks that may be simultaneously placed on an object, so long as the locks can coexist. This means that all locks that block your access to an object must be cleared before you can use that object.

The check marks in Table 2-4 show the locks that can coexist for a single object. As you can see, full locks are not compatible with any other type of lock, while prevent full locks are compatible with all locks **except** full locks.

How Automatic Locks Are Applied

Paradox locks objects intelligently. In every situation, it applies the least restrictive lock consistent with the operation you are performing. The program therefore allows the greatest possible access to tables, forms, and reports by all users. In addition, Paradox provides enhanced concurrency for processing queries and reports. This capability is described under "Processing Queries and Reports" later in this section.

Table 2-5, on the next page, summarizes how Paradox applies locks automatically for each interactive operation. For example, if you are performing an **insert query** (see Chapter 4), when you place the query form on the workspace a prevent full lock is placed on the table you are querying. When you press Do-It! [F2], a full lock is placed on the table during the time the query is processed.

There are also operations for which Paradox places locks on two or more tables simultaneously. For example, when you select **Tools/More/Add** (see Chapter 10), Paradox places locks on both the source and the target table.

Table 2-5. Automatic Locking in Paradox

Menu	Operation	Effect
View	Table View	prevent full lock
	Form View	prevent full lock
Ask	Regular, Find, Set	prevent full lock; automatically takes "snapshot" of records involved in the query at Do-It!
	Insert, Delete, Changeto	prevent full lock; full lock at Do-It! (during query processing)
Report†	Output, RangeOutput	prevent full lock; automatically takes "snapshot" of records involved in the report as it is output
	Design	prevent full lock on table; full lock on report being designed
	Change	prevent full lock on table; full lock on report being changed
Create	Create	full lock on table being created
	Borrow	prevent full lock on table being borrowed
Modify	Sort (to new table)	write lock on source, full lock on target (if any)
	Sort (to same table)	full lock
	Edit†	full lock
	Coedit†	prevent full lock, prevent write lock while any record is locked
	DataEntry†	prevent full lock on source, prevent write lock on source at Do-It!
	MultiEntry	write lock on source, write lock on map, prevent write lock on all targets at Do-It!
	Restructure	full lock
ValCheck	Define/Clear	full lock on table during edit or data entry session in which ValCheck defined
	TableLookup	prevent full lock on lookup table during edit or data entry session
Image	KeepSet	full lock on table while creating settings file
	Image/Graph/Crosstab	prevent full lock, automatically takes "snapshot" of records involved in crosstab
	Image/Graph/View	prevent full lock
Forms†	Design	prevent full lock on table; full lock on form
	Change	prevent full lock on table; full lock on form
Tools	Rename	full lock on source and target
	QuerySpeedup	same as Ask at Do-It!
	ExportImport	
	Export	write lock on source
	Import	full lock on target
	Copy	
	Tables	write lock on source (with family), full lock on target
	Objects (other than tables)	write lock on source object, full lock on target, prevent full lock on table
	JustFamily	prevent full lock on source table, write lock on source table objects, full lock on target table and target objects
	Delete	
	Table	full lock on table
	Forms, Reports	full lock on object, prevent full lock on table
	Settings, ValCheck	full lock on object, full lock on table
	Info	
	Structure	prevent full lock
	Family	write lock, including family
	Add	write lock on source, prevent write lock on target
	MultiAdd	write lock on source, write lock on map, prevent write lock on all targets
	FormAdd†	prevent full lock on all targets, prevent full lock on all sources at Do-It!, for update write lock on all targets, write lock on all sources at Do-It!, for new entries write lock on all sources, prevent write lock on all targets
		full lock
	Subtract	full lock on source, full lock on target
	Empty	full lock
	Protect	full lock

† For multitable operations, specified locks are applied to all tables involved in the operation.

Effects of Locks

Full Lock

A full lock is the most restrictive lock. Once you start an operation that requires Paradox to apply a full lock to an object, other users cannot access that object for any reason until the lock is released. If the object is a table, a full lock is placed on the table and its entire family.

Suppose you are restructuring the *stock* table. As soon as you begin the operation, Paradox automatically places a full lock on *stock* and all of its associated forms, reports, indexes, and other family members. The lock remains in effect until the restructuring is complete.

The full lock is necessary because if someone else were to gain access to *stock* while you were restructuring it, internal inconsistencies could result. For example, if another user were viewing the table when you deleted a field from its structure, the new structure of *stock* would no longer be consistent with the image of the table being viewed by the other user. The full lock is designed to prevent such problems.

Full locks are incompatible with all other locks. If you are trying to start an operation for which a full lock is required (such as restructuring, emptying, or deleting a table) and the object already has any sort of lock applied to it, you will not be able to continue. Instead, you'll get a message like **Orders table has been locked by Joe.** You will have to wait until all locks on the object have been cleared before you can perform the operation. (You can go on to other operations in the meantime.)

Write Lock

A write lock allows other users to access an object at the same time you are doing so, but prevents them from changing it in any way. For example, if you are copying the *orders* table, other users may use it at the same time as long as they don't change the table's structure or contents (through such operations as editing or restructuring it).

If you try to start an operation for which a write lock is required, and the object already has a full lock or a prevent write lock on it, you will not be able to continue. Write locks are compatible only with other write locks and with prevent full locks.

Prevent Write Lock

A prevent write lock doesn't actually lock an object; instead, it prevents other users from starting operations that require either a full lock or a write lock. It is most often used in situations in which modification of a table by two or more users at once is either required or allowed. For example, in Coedit mode, multiple users must be able to modify a table simultaneously. If any one user placed a write lock on the table, the others would not be able to make their changes.

You cannot start an operation for which a prevent write lock is required if the object you need already has either a full lock or a write lock on it. Prevent write locks are compatible with other prevent write locks and with prevent full locks.

Prevent Full Lock

A prevent full lock is the least restrictive lock and therefore allows the highest level of concurrent access. When you are performing an operation that sets a prevent full lock, other users can start any other operation using the object except those requiring a full lock.

For example, when you view a table a prevent full lock is placed on it. This allows other users to query the table, print reports, enter data, and do any other operations that don't require exclusive use of the table.

Explicit Locks on Objects

In addition to automatic locking, you can **explicitly** lock tables and other objects you are working with. You may want to lock a table explicitly when you know you are going to need it and you want to make sure it is available. There is no difference in the effects of automatic and explicit locks.

For example, suppose you want to enter new data into the *customer* table using **Modify/DataEntry**. As indicated in Table 2-5, when you begin the operation by selecting **Modify/DataEntry**, Paradox places a prevent full lock on *customer*. This prevents other users from changing the table's structure while you are entering data into it. Then, when you press Do-It! [F2] to add the new records to *customer*, Paradox places a prevent write lock on the table.

But suppose another user places a write lock on *customer* while you are entering data. In that case, when you press Do-It! [F2], you could not get sufficient control over the table to finish your data entry operation.

If you anticipate such a situation, you could explicitly place a prevent write lock on the *customer* table before you begin data entry. This guarantees that the table will be available to you when you want to complete your data entry operation.

Explicit locks are used most often for multiuser applications, when the application developer needs precise control over access to tables, forms, and reports. When using Paradox interactively, you should use explicit locks sparingly since they may needlessly prevent other users from accessing objects.

Since Paradox's automatic locks always try to maximize concurrent access, they are most likely to produce the greatest good for the greatest number of users on the network.

Setting an Explicit Lock

You can set locks explicitly either through the **Tools/Net/Lock** or **Tools/Net/PreventLock** menu selections, or through the PAL LOCK command. See Chapter 10 (Tools) of this manual for a description of **Tools/Net/Lock** and **PreventLock** along with a more detailed discussion of explicit locks. See Chapter 18 (Multiuser Applications) of the *PAL User's Guide* for a discussion of PAL locking capabilities.

Record Locks

Paradox's special Coedit mode lets multiple users edit tables simultaneously and interactively. While you are coediting with other users and begin to change a record, Paradox automatically locks it. When you finish making changes to the record and move the cursor to another record, Paradox automatically removes the lock and posts your changes to the table.

Alt **L** **Lock Toggle**

You can also use Lock Toggle [Alt][L] to explicitly lock or unlock a record. The status line at the top of the screen tells you whenever you've locked a record. In addition, the edit mark (◄) that appears at the end of the current field appears highlighted.

When a record is locked, other users may view it, but cannot modify or delete it. If you try to change a record that has been locked by another user, Paradox tells you the name of the user who has locked the record.

Coedit mode also provides special support for handling key violations. For a complete description of coediting and record locking, see Chapter 7 (Modify).

Processing Queries and Reports

Paradox provides special concurrency for processing queries and reports. Both reports and regular queries (that is, any except **insert**, **delete**, or **find** queries) can be processed so long as the objects involved do not have a full lock on them. When you begin to perform a query or print a report based on a shared table, Paradox takes a "snapshot" of the table or tables being used and bases the report or query on the snapshot. (To speed processing, a snapshot is not taken if no one else is using the table.)

This capability lets you process queries and produce reports while other users are viewing or even changing the records in a table. If another user happens to modify the table during the brief time the snapshot is being taken, Paradox will try to take the snapshot again until it is successful. You'll see a message each time a retry occurs. If you want to cancel the automatic retries, press [Ctrl][Break].

Refreshing Your Screen

When you are working with a table that others are also using, your image of the table may at times be "out of sync" with other users' images of it. This is because they may be making changes that cannot be reflected instantaneously on your screen.

Paradox provides three ways to **refresh** (update) your image of a table so that it contains the most current information. When the screen is refreshed, you'll see the message **Refreshing**... in the message window and the values on the screen will be updated. Like other Paradox multiuser features, the screen refresh capabilities are designed to provide the most up-to-date information while preventing corruption and data loss.

Alt **R** **Refresh**

- **Explicit refreshing**: You can use Refresh [Alt][R] to refresh the current image on the screen at any time. If any values currently displayed on the screen are out of date—that is, if other users have changed them since the last time the image was updated—then Paradox will update the image you are viewing.
- **Automatic refreshing at fixed intervals**: Using either the **Tools/Net/AutoRefresh** selection on the Main menu, the **AutoRefresh** selection on the Coedit menu, or the Custom Configuration Program, you can tell Paradox to refresh your screen automatically at any interval you specify between 1 second and 1 hour. (Leaving the interval blank disables the AutoRefresh feature.)

  Once you've set this interval, Paradox checks automatically at that interval to see if others have made any changes to the table. If they have, Paradox refreshes your screen.
- **Automatic refreshing as needed**: Even if you've set an automatic refresh interval, Paradox will automatically update your screen on an "as needed" basis. Suppose you are coediting the *orders* table and start to change a record that another user has modified. Before allowing you to make changes, Paradox automatically

refreshes your image of *orders* so you see the current values in that record.

The way you work with Paradox can help you decide which screen refresh option to use. Some users find fixed interval updates distracting when values on the screen change before their eyes automatically. They prefer records to be updated only when they need to be. Other users find it essential to see other users' changes to a table as soon as they happen.

In either case, you can always explicitly update the screen by pressing Refresh [Alt][R].

For a complete description of the automatic refresh capabilities see the discussion of **Auto-Refresh** in Chapter 10 (Tools) and Chapter 14 (Advanced Topics).

Data Security and Protection

When working on a network, your sensitive or confidential information must not be compromised. Paradox provides two ways to ensure that only those whom you authorize can access your data.

- The **Tools/More/Protect** selection of the Main menu contains an extensive array of capabilities that enable you to selectively restrict other users' access to your tables, forms, reports, and other objects.
- **The Paradox Protection Generator** allows network administrators and application developers to set up groups of users with different levels of access to selected Paradox objects. For details, see the *Network Administrator's Guide*.

You can use the **Tools/More/Protect** selection to set up two kinds of passwords for each table: **owner passwords** and **auxiliary passwords**. As the "owner" of a table, you can limit access to it by establishing its owner password. Once you do, the table is encrypted; no one else can access it without knowing either the owner password or an auxiliary password you define. By setting up auxiliary passwords, you can provide restricted access to the table and its family as you choose.

With auxiliary passwords you can control

- **Access to tables**: You can authorize users who hold an auxiliary password to have one of five levels of access to the table:
  - **ReadOnly**: The user can view the table, but cannot change it in any way.
  - **Update**: The user can change non-key fields of a table, but cannot insert or delete records or change key fields.
  - **Entry**: The user can enter new records and change non-key fields, but cannot delete records or empty the table.
  - **InsDel**: The user can insert and delete records and empty the table, but cannot restructure or delete it.
  - **All**: The user has complete access to the table, including the ability to restructure or delete it.
- **Access to fields**: Beyond controlling the level of access to a table, you can authorize users with an auxiliary password to have one of three different levels of access to each **field** in the table. The following field rights can be set:
  - **None**: The user has no rights to a particular field; whenever the table is displayed, the values in the field are hidden.
  - **ReadOnly**: The user can view the values in the field, but cannot change them.
  - **All**: The user can both view and change the values in the field.
- **Access to objects associated with a table:** You can authorize users with an auxiliary password to have various levels of access to a table's family of forms, reports, validity checks, and image settings.

In combination, these tools provide a flexible and powerful means of allowing you to specify the precise degree of access to your data you want other users to have.

Network Drives and Directories

On a typical standalone system there are usually two or three disk drives labeled **A** through **C**. On a network there may be many more drives available. For instance, your network may have drives labeled **F**, **G**, and **P**. Paradox allows you to access data stored on any network drive or directory just as if it were available on a local disk.

Private Directories

In order to use Paradox on a network, each user must have a **private directory**. Your private directory is used to store your temporary objects, and to let you store and work with Paradox tables and other objects you don't want to share with others on the network.

Storing Temporary Objects

Your private directory is used to physically store all the temporary tables and other temporary objects

you generate during a Paradox session (see "Temporary Tables" earlier in this chapter). For example, whenever you perform a query, the resulting *answer* table is placed in your private directory. Similarly, if you use Instant Script Record [Alt][F3], the *instant* script is stored in your private directory. This prevents other users' temporary objects from overwriting your own.

Even though these temporary objects are actually stored in your private directory, when you are using Paradox it will appear as though they are present in your current working directory. Most of the time you will not even be aware that your private directory is being used.

For instance, let's say that your current working directory on the network is *p:\pdoxdata* and that you've just done a query on *orders*. The *answer* table will appear on your screen. Its name will also appear on the menu of table names you get when you press [Enter] in response to the prompt for a list of tables in the working directory (see "Responding to Prompts" earlier in this chapter). However, ANSWER.DB will not be included on the list you get if you select **Tools/Info/Inventory/Files** to show the names of all files in your working directory. Instead, it will be on the list of files in your private directory.

Restricting Access

When you designate a private directory, you prevent all other Paradox users on the network from accessing the tables, forms, reports, scripts, and other objects stored there. This is most useful when your private directory is located on the network. However, for faster performance if your workstation has a local hard disk, it is preferable to put your private directory there.

Remember that other users will not be able to access your private directory. If your private directory is a network directory that contains tables or scripts that are used by others, you could be preventing them from using information they need. You therefore should not declare a network directory to be your private directory unless you know that others do not need to use the tables, scripts, and other objects stored in it.

Setting Up Your Private Directory

In most network installations, the network administrator will be responsible for establishing each user's private directory for Paradox (see the *Network Administrator's Guide* for complete information). In those installations where setting up a private directory is an individual responsibility, there are two ways of doing so:

- Use the **Tools/Net/SetPrivate** menu selection to designate or change your private directory during a Paradox session. See Chapter 10 (Tools) for details on **SetPrivate**.
- Use the Custom Configuration Program to designate a default private directory that will be set each time you start Paradox. See Chapter 14 (Advanced Topics) for details on using the CCP to set up a default private directory.

You will not be able to declare a directory private if someone else has already done so, or if other network users are accessing tables, scripts, or other objects contained in that directory.

User Names

When it is running on a network, Paradox tries to associate a name with each person using it. This lets Paradox keep you informed about the status of objects that can't be accessed because they are already in use.

For example, suppose that while Sandy is editing the *orders* table, Pat wants to do a query on the same table. Since Paradox automatically places a full lock on a table while it is being edited, Pat can't access *orders* to process her query.

In this situation, Paradox can make use of its knowledge of user names to give Pat a message like **Orders table has been locked by Sandy**. At this point Pat can request (perhaps by sending a message over the network) Sandy to temporarily end her edit session or switch into Coedit mode so that the query can be performed.

It's possible to thwart this feature by entering a false or blank name. However, we've found that working with Paradox in a multiuser environment is much more efficient and enjoyable when everyone's identity is known. That way, people can cooperatively decide how to share the resources they all need.

Setting Your User Name

There are three ways in which your user name can be designated:

- On networks that support user names, Paradox can use the network operating system to identify each user. In these cases, it's not necessary for you to enter your user name explicitly. Consult your network administrator to see if Paradox can determine your user name directly from the network.
- You can use Paradox's Custom Configuration Program to set a default user name. Select **Network/UserName** from the CCP main menu and

type your name at the prompt. Then, each time you start Paradox, it will take the name you've entered in the CCP as your network user name. This name will override any name Paradox finds for you through the network operating system.

- While running Paradox, select **Tools/Net/User-Name** from the Main menu, and when prompted, type your user name. The name you enter will be used only during the current Paradox session. It will override any user name that Paradox has picked up through the network or that you've set through the CCP.

Tools/Info/Lock and Tools/Info/Who

You may want to see a list of all the locks that are currently in effect for a particular table and its family. This is especially useful in situations when you want to access a table and get a message like **Orders table has been locked by Sandy and 3 others.** In such cases, you can find the names of all users who are locking the table by selecting **Tools/Info/Lock** from the Main menu.

Paradox will prompt you to enter the name of the table you are interested in. It will then list all of the locks on the table and its family and identify the user who has placed each one.

If you want to get a list of all of the users who are presently using Paradox on the network, you can use the **Tools/Info/Who** selection from the Main menu.

For more information on the **Tools/Info** selections see Chapter 10 (Tools).

Paradox International Features

Paradox provides full support for number, date, and sorting conventions commonly used outside the U.S. It also allows you to use the full IBM extended character set in your tables and reports.

Paradox is configured with the number, date, and sorting conventions for the country group specified at installation. See Chapter 3 of the *Introduction to Paradox* or the *Network Administrator's Guide* for complete information about installation. After the program is installed, you can use the Custom Configuration Program to further customize all of the international features of Paradox.

This section provides an overview of all of Paradox's international capabilities. Each feature described here is explained in more detail elsewhere in this manual or in one of the other Paradox manuals.

Number Formats

Paradox supports two basic number formats:

- **U.S. format**: Uses "." to separate decimal digits from whole digits and "," to separate groups of three whole digits. This convention is also used in England, Australia, and other English-speaking countries.
- **International format**: Uses "," as the decimal separator and "." to separate groups of whole digits.

Here's how the number "one thousand forty-six" using each format with two decimal places would be shown.

U.S. Format	International Format
1,046.00	1.046,00

The default number format is set automatically and depends upon the country group selected during installation. You can change this default through the CCP. See Chapter 14 (Advanced Topics) for information on changing the default numeric convention.

The default number format in effect when you start a Paradox session is used throughout that session in the following ways:

- to format numbers on the screen for viewing, editing, and data entry
- in queries
- in reports
- in PAL.

One exception is that the U.S. format must always be used for PAL numeric constants (see Chapter 3 of the *PAL User's Guide* for more information).

The **Field/Reformat/International** selection on the Report Generator menu lets you change the number convention used in a specific field of a report at any time without having to change the default numeric convention currently in effect. See Chapter 4 (Designing Tabular Reports) of *Presenting Paradox Data* for details.

Date Formats

Paradox supports three date formats for interactive use: *mm/dd/yy, dd-Mon-yy,* and *dd.mm.yy*. The default date format for both screen display and report output depends upon the country group selected at the time of installation. Chapter 14 (Advanced Topics) describes how to use the Custom Configuration Program to change the default format.

In addition to the three on-screen formats, there are eight more date formats that are available for report output, for a total of eleven. The same eleven formats are available through the PAL FORMAT function for use in displaying and outputting dates in a script or application. The eleven date formats are described in Chapter 3 (Report Basics) of *Presenting Paradox Data* and in Chapter 5 of the *PAL User's Guide*.

Sorting

Paradox lets you specify the order in which it sorts the records in your tables, reports, and query results. For several reasons, the standard Ascii sort order used by many U.S. personal computer programs (including Paradox releases 1.0 and 1.1) is not appropriate for international (or even many U.S.) applications:

- Since Ascii order separates uppercase from lowercase letters, names like *deFigueiredo* and *d'Angelo* do not sort in proper sequence.
- Using Ascii order, special accented characters such as å, ç, ñ, and ø, which are used frequently in international applications, are not sorted in proper alphabetic sequence. This also applies to characters that represent ligatures, such as ü and ß, which are German equivalents for "ue" and "ss" respectively.
- The rules of capitalization used in the Ascii sort order are not appropriate for the special international characters.

To address these problems, Paradox offers four different sort orderings:

- **Ascii**: Sorts records in standard Ascii order, in which capital letters are grouped together before lowercase letters. Also, special accented characters often used outside the U.S., such as ç and ñ, follow all unaccented characters in the sort order.
- **Intl** (International): Combines capital, lowercase, and special characters into a unified sorting order. As a result, records are arranged according to their proper alphabetic position, irrespective of case or diacritical marks. Also, characters representing ligatures, such as ü and ß are sorted correctly (i.e. ü is sorted as if it were "ue" and ß sorted as if it were "ss").
- **SwedFin** (Swedish/Finnish): A modification of the International sort order. Certain special characters used in Sweden and Finland, such as å and ø are placed at the end of the regular alphabetic sequence. In all other respects the Swedish/Finnish sort order is equivalent to the International ordering.
- **NorDan** (Norwegian/Danish): A modification of the International sort order. Correctly handles certain special characters used in Norway and Denmark. In all other respects the Norwegian/Danish sort order is equivalent to the International ordering.

The sort ordering most appropriate to the country group specified at the time of installation is automatically set. Chapter 14 (Advanced Topics) contains instructions on changing the sort order should you ever need to do so (if you are using Paradox on a network, you'll probably need to see your network administrator to do this). Chapter 14 also contains a table that shows the exact sequence of characters in each sort ordering. The selected sort order affects operations in six areas of Paradox:

- **Sorting**: The sort order affects the arrangement of records in tables you sort using the **Modify/Sort** selection and the PAL SORT command.
- **Reports**: The sort order governs the arrangement of records grouped in a report and affects the results of calculations involving the minimum or maximum values of alphanumeric fields.
- **Queries:** The sort order affects the arrangement of records in the *answer* table, and the results returned by the >, <, > =, < =, *calc min*, and *calc max* operators when used with alphanumeric values.
- **Validity Checks**: The sort order affects the results you obtain when using the **HighValue** and **LowValue** options in validity checks for alphanumeric values, as well as the use of the !

symbol (forced capitalization) in validity check pictures. For information on validity checks see Chapter 7 (Modify).

- **Keys**: When you specify key fields in a table, the records in that table are kept in sorted order according to the values in the key fields. The sort order affects the arrangement of records in keyed tables. See Chapter 6 (Create) for more about key fields.
- **PAL**: The sort order affects the operation of the PAL UPPER and LOWER functions and the results returned by the >, <, > =, < =, *calc min*, and *calc max* operators when they are used with alphanumeric values. It also affects the use of the ! symbol in PAL picture statements (see Chapter 5 of the *PAL User's Guide* for a discussion of PAL pictures).

The IBM Extended Character Set

With Paradox

Paradox fully supports the IBM extended character set needed for international applications. With a couple of exceptions, you can use the IBM extended character set with Paradox just as you would use the regular portion of the character set. The exceptions are as follows:

- You should not include the extended characters in Paradox table names or script names.
- You cannot use extended characters in example elements in query forms.

With Your Printer

Paradox includes two additional printer setup strings to make it easy for most printers to access international characters.

In order to print records containing characters in the extended character set such as ü and è, your printer must be fully IBM compatible. To set up your printer to access the extended character set, you must do two things:

1. Make sure your printer is set for the IBM mode. This is usually done by setting dip switches on or in the printer. Check your printer's manual for the correct dip switch settings.
2. When you print a report, use one of the two new Paradox setup strings that tell the printer to print the extended character set. The two new strings are
   - **Intl-IBMcompatible**: To print the complete extended character set in normal size
   - **Intl-IBMcondensed**: To print the complete extended character set in small size.

To use these setup strings, choose **Settings/SetUp/Predefined** from the Reports menu and select the string you want. If you are not familiar with setup strings, read about them in Chapter 14 of this manual and Chapter 3 of *Presenting Paradox Data*.

If your printer does not operate correctly with the setup strings provided with Paradox, check your printer's manual for the exact setup string you must use to access the extended character set. You can then either enter the string in each report specification, or use the Custom Configuration Program to add it to the strings in the printer table so that it will be available with all reports. See Chapter 14 for information on modifying the printer table.

Other International Issues

Several other sections in this manual discuss issues that may be important to Paradox users outside the U.S.:

- Importing and exporting number and currency data formatted with the international numeric format (see **Tools/ExportImport** in Chapter 10).
- Disabling [Ctrl][Break] to avoid possible problems you may encounter using Paradox with certain international keyboard drivers (Chapter 14).

Backing Up Your Data

Most experienced computer users have learned (the hard way!) to back up their files.

Paradox uses a sophisticated **virtual memory management** system to maintain, update, and keep track of information in memory and on your disks. When you exit from Paradox, all your information (except that in temporary tables) is automatically saved for you.

When you enter or change information in Paradox tables, the entries are not final until you press Do-It! [F2] or select **DO-IT**! from the menu. However, while adding or editing records, you will occasionally see your disk drive light turn on as Paradox stores the information on the disk. This minimizes the chance of losing valuable data.

Between disk saves, the new or changed information is kept in your computer's memory where it is vulnerable to power failures and other errors. If you want to further reduce the chance of data loss, press Do-It! [F2] periodically to save your changes on the disk.

Once stored on disk, your tables are more secure, but still subject to disk failures. To protect them, follow this rule:

- **Never** *get caught without a backup copy of any information you could not, or would not want to, re-enter if it were lost.*

You can use the **Tools/Copy** selection, described in Chapter 10, to back up your tables. If you have a two-floppy system, make sure you read the detailed instructions on how to use the **Copy** selection to copy from one floppy disk to another. When you copy a table, Paradox will automatically copy the rest of its family as well.

Recovering File Space after Deleting Records

After you delete records from a table, either during an editing session, through a delete query, or by subtracting the records of one table from another, the file space occupied by the deleted records will not automatically be made available to you. It is easy to recover this space, however. Simply select **Modify/Restructure** from the Main menu and tell Paradox you want to restructure the table from which you have deleted the records. When the table's structure appears on the screen, press Do-It! [F2]. This operation will recover the previously used space on your disk without affecting your data or any forms or reports you have defined for the table you are restructuring.

View

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View is used to show tables on the screen. It lets you get a feel for your information by examining it up close. Once a table is in view, you can move rapidly to any part of it. You can also rearrange, resize, or reformat the fields to fit your needs at the moment.

When you choose **View** from the Main menu, Paradox will ask for the name of the table you want to see:

```
Table:
Enter name of table to view, or press ↵ to see a list of tables
```

Type the table name and press [Enter] or select the table from a menu as described under "Paradox Menus and Prompts" in Chapter 2 of this manual.

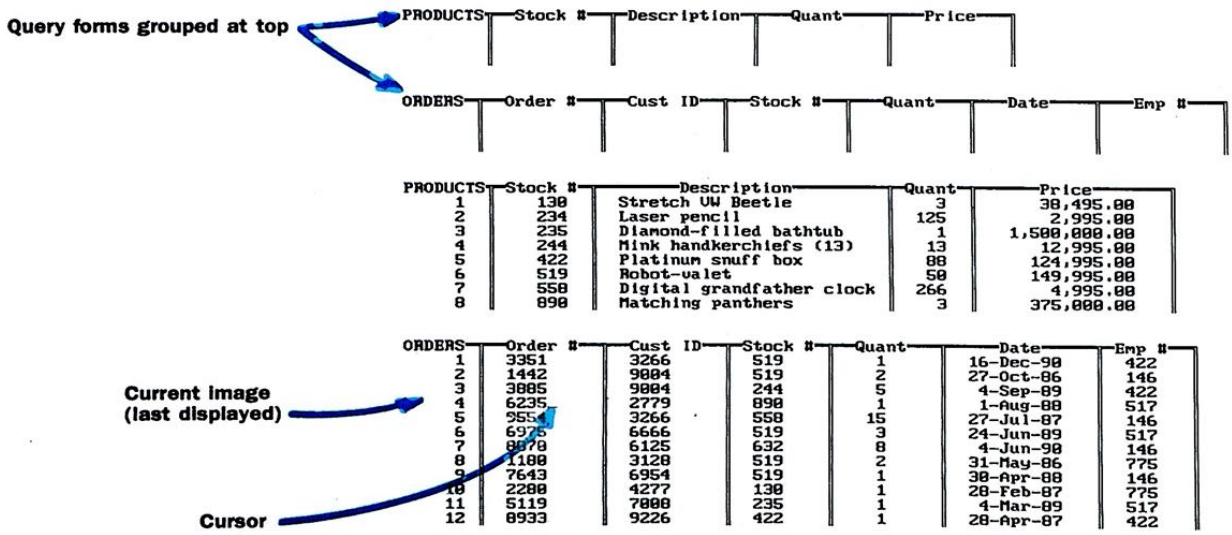
What appears on the screen is actually an **image** of the table. The table itself remains secure on your disk; changes you make to the image will not affect the table unless you say so.

Viewing More Than One Image

You can display many images on the workspace at one time; the exact number depends on the configuration of your computer system. When you add a new image to the workspace, it becomes the **current** image and is placed **below** the images already displayed. You can tell at a glance which image is current because it contains the cursor and its borders are highlighted. Query forms, if present, are always grouped together at the top of the workspace.

You can press Up Image [F3] and Down Image [F4] to move the cursor among the images on the workspace. When you move from one image to another, Paradox remembers where the cursor was. When you return to an image, the cursor will be where you left it.

If you want, you can use **View** to display two or more images of the same table at once. This is useful for comparing records located in different parts of a large table.



PRODUCTS

Stock #	Description	Quant	Price

ORDERS

Order #	Cust ID	Stock #	Quant	Date	Emp #

PRODUCTS

	Stock #	Description	Quant	Price
1	130	Stretch VW Beetle	3	38,495.00
2	234	Laser pencil	125	2,995.00
3	235	Diamond-filled bathtub	1	1,500,000.00
4	244	Mink handkerchiefs (13)	13	12,995.00
5	422	Platinum snuff box	88	124,995.00
6	519	Robot-valet	50	149,995.00
7	558	Digital grandfather clock	266	4,995.00
8	890	Matching panthers	3	375,000.00

ORDERS

	Order #	Cust ID	Stock #	Quant	Date	Emp #
1	3351	3266	519	1	16-Dec-90	422
2	1442	9004	519	2	27-Oct-86	146
3	3885	9004	244	5	4-Sep-89	422
4	6235	2779	890	1	1-Aug-88	517
5	9554	3266	558	15	27-Jul-87	146
6	6975	6666	519	3	24-Jun-89	517
7	8870	6125	632	8	4-Jun-90	146
8	1100	3128	519	2	31-May-86	775
9	7643	6954	519	1	30-Apr-88	146
10	2280	4277	130	1	28-Feb-87	775
11	5119	7000	235	1	4-Mar-89	517
12	8933	9226	422	1	28-Apr-87	422

Form View

F7 **Form Toggle**

Whenever a table is displayed on the workspace, you can press Form Toggle [F7] to look at it in form view. Depending on the form that's currently selected, you may see

- the current record of the current table
- many records from the current table
- records from two or more tables

arranged on a form on the screen. Forms on which you can see more than one record or table are discussed later in this section.

Although table view lets you look at many records simultaneously, if the table has more than four or five fields you probably won't be able to see all of them at once. On a single-record form, on the other hand, you can see only one record at a time, but all of its fields (unless it has a great many).

Because [F7] is a toggle, you can switch between the table view and the form view at the touch of a key. As you toggle back and forth between the table and form, the position of the cursor is always maintained in the current field of the current record. See "The Keyboard" (especially the fold-out diagram) in Chapter 2 (Fundamentals) for details on moving around a form.

Form view gives you the option of displaying information in a **custom form**, on which you can arrange fields anywhere you want them to appear on the screen. Custom forms can include up to 15 screenfuls of information for each record. Also, they allow you to format fields so that they will wrap onto multiple lines on the screen.

Once you've designed a custom form, you can use **Image/Pickform** to choose which form is displayed when you press Form Toggle [F7]. See Chapter 2 (Designing Forms) in *Presenting Paradox Data* for complete information on the capabilities of custom forms and the process of designing and changing them.

If you are viewing an image on a single-table form, pressing Up Image [F3] or Down Image [F4] to move to another image will automatically end form view.

Colors and Highlighting in Custom Forms

When you design a custom form, you have complete control over the colors displayed on a color

Viewing Customer table: Record 1 of 33 Main

CUSTOMER	Cust ID	Last Name	Init	Street	City
1	1386	Aberdeen	F	45 Utah Street	Washington
2	1388	Svenvald	I	Gouvernment House	Reykjavik
3	1784	McDougal	L	4950 Pullman Ave NE	Seattle
4	2177	Bonneferme	S	128 University Drive	Stanford
5	2579	Chavez	L	Cypress Drive	Palm Springs
6	2779	Fahd	S	The Palace	Riyadh
7	3128	Elspeth, III	R	1 Hanover Square	London
8	3266	Hanover	A	15 State Street	Dallas
9	3271	Massey	C	29 Aragona Drive	Oxon Hill
10	3771	Montaigne	L	30 Tauton Drive	Bellevue
11	4277	Matthews	R	P. O. Box 28336	Albuquerque
12	4335	Farouk	K	Hotel Cairo	Cairo
13	4400	Samuelson	F	Bull Run Ranch	Aurora
14	4485	Fischer	R	14 Willow Lane	Birmingham
15	4589	Leonardo	D	198 Via Canales	Rome
16	4700	Harris	J	Old Country Road	Atherton
17	4884	Anders	B	Jaktstigen 42	Lidingo
18	5341	Chevalier	R	392 Boulevard Raspil	Montpelier
19	5720	Helms	D	52 Brattle Street	Cambr
20	5855	Chin	F	Hotel Orient	Juro
21	6125	Haves-Anderson	D	Waves Cottage	Palm
22	6666	Matthews	J	1050 12th Street	San I

Table view shows many records, but not all fields

Viewing Customer table with form F2: Record 3 of 33 Main

CUSTOMER CREDIT INFORMATION
Luxury Gifts Department

Customer ID: 1784
Last Name: McDougal
Initial: L
Street: 4950 Pullman A
Ave. NE
City: Seattle
State: WA
Zip: 98105
Country:

Credit: 150,000.00

Single table form view shows only one record, but all fields

monitor, and over the highlighting (high intensity, reverse video, and blinking) displayed on a monochrome monitor. See **Form/Style** in Chapter 2 (Designing Forms) of *Presenting Paradox Data* for details.

Form colors will not be displayed on a monochrome monitor, and monochrome highlighting (except blinking) will not be displayed on a color monitor. However, if you want to use a form that was designed for a different kind of video system, you can use the **Video/Colors** setting in the Custom Configuration Program to "translate" color combinations into monochrome attributes or vice versa. For example, if you have a color monitor, you might want red text on a blue background to represent what was specified as high-intensity text on a monochrome monitor. If you don't use the CCP to select a color combination for high-intensity text, a default color combination will be used.

Similarly, if you have a monochrome monitor, you might want high-intensity text to represent what was specified as red text on a blue background on a color monitor. If you don't use the CCP to select monochrome attributes for red on blue, default attributes will be used.

For more information on the Custom Configuration Program, see Chapter 14 (Advanced Topics).

Viewing Multirecord Forms

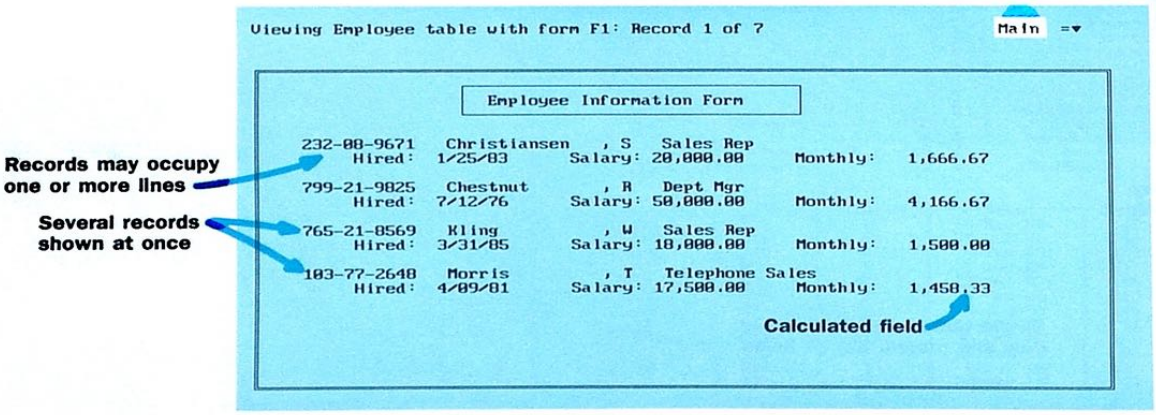
As described in Chapter 2 (Designing Forms) of *Presenting Paradox Data*, you can design forms that show more than one record of a table at the same time. Multirecord forms allow you to create "scrolling regions" on your forms that are like miniature table views. They combine the advantages of both tabular and form views of a table, and are especially useful

- when you want to customize Paradox's normal tabular presentation of data. For example, using multirecord forms you can create "tables" that are double- or triple-spaced or include calculated fields, like the total amount of an order.
- in multitable forms (described in the next section), when you need to show multiple detail records associated with a single master record.

Viewing records on a multirecord form is very similar to viewing records in table view. You can move the cursor around in the same way, and scroll records vertically on the screen, but there are three major differences:

- Since a form can't exceed the screen's width, no fields can be hidden off the edge of the screen. You can't scroll horizontally in the tabular arrangement of records, so keys like [Ctrl][→] have no effect.
- If the fields of a record occupy more than one line, press [↑] and [↓] to move through the records line by line.
- As on a single-table form, you can use [Ctrl][PgUp] and [Ctrl][PgDn] to move directly from record to record, even if each one occupies several lines.

A Multirecord Form



Viewing Multitable Forms

As described in Chapter 2 (Designing Forms) of *Presenting Paradox Data*, you can design forms that show more than one table. Multitable forms are especially useful

- in any operations in which you want to display records from one table that are related to records in another
- whenever you want to view information from two or more tables on a form at once.

A multitable form is always based on a **master** table—the one for which the form was designed. You display the form by viewing the master table and then selecting **Image/Pickform** or pressing Form Toggle [F7] in the usual way. Forms for other tables are always **embedded** on the master form. The master and embedded forms may be **linked** (logically associated) or **unlinked**.

When you start viewing a multitable form, the cursor is on the record you were viewing in table view when you chose the form. This record is in the master portion of the form.

Viewing a multitable form is very much like viewing several separate forms or images on the screen. You can use Up Image [F3] and Down Image [F4] to move the cursor from the master form to each embedded form in turn. Once on either the master or an embedded form, you can use the cursor keys to move from field to field and record to record, as if you were viewing a single-table form. There is one exception:

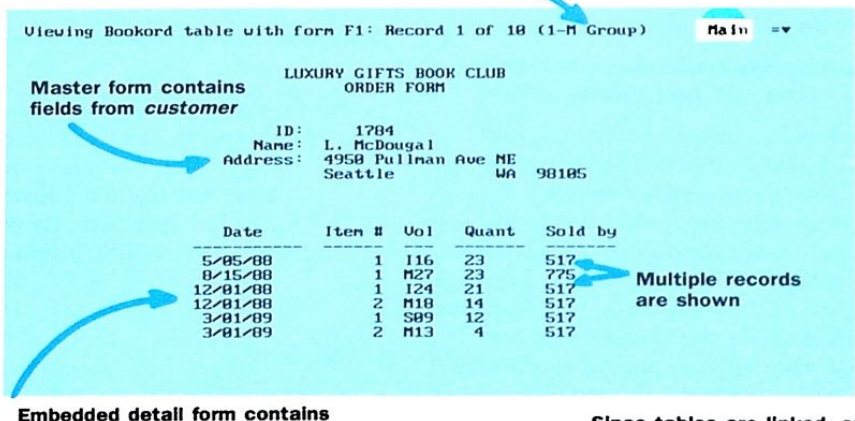
- If the master and embedded tables are **linked**, then the embedded form will show only those records in the embedded table that are logically related to the current record in the master table.

  For example, if *customer* is the master table and *bookord* the embedded (or **detail**) table, only orders placed by the current customer are displayed on the embedded form. You can't scroll through the detail table to orders placed by other customers. Instead, use Up Image [F3] or Down Image [F4] to move to the master table and move to another customer record. That customer's orders will **automatically** appear on the embedded form. This is the only case in which moving the cursor in one image affects another.

If the two tables are unlinked, the records on the master and embedded form are unrelated. You can scroll independently to any record in any table on the form.

Linked tables on a multitable form are subject to special editing restrictions described under "Editing Records in Multitable Forms" and "Coediting with Multitable Forms" in Chapter 7 (Modify). For more information on linked and unlinked tables in a form, see Chapter 2 (Designing Forms) in *Presenting Paradox Data*.

A Multitable Form



Viewing a Graph

Ctrl F7 **Graph Toggle**

A graph can provide an alternative view of the data in a table. You can display a standard graph of the table you're viewing by pressing Graph Ctrl F7, or you can use the Graph Design menu to create a custom graph. As described in Chapter 8 "Image" of this book and Chapters 6 and 7 of *Presenting Paradox Data*, you may need to use queries or crosstabs to extact information from some tables before you'll be able to create an effective graph. At any point in the design process you can view the graph to preview your changes.

Examining an Image

Once an image is displayed, you can use the cursor keys on the numeric keypad to move around and examine it. See "The Keyboard" in Chapter 2 of this manual for details about the operation of the cursor keys in both table view and form view.

While in table view you can press Rotate Ctrl R to rotate the fields of an image on the screen. In addition, you can use the **Image** selection on the Main menu to

- resize the image
- resize, reformat, or rearrange the fields
- move to any record, field, or value you specify.

In form view, Rotate Ctrl R is not available, but you can use the **Image** selection to

- reformat fields
- move to a specified record, field or value.

For more information, see Chapter 8 (Image) of this manual.

Viewing Values That Don't Fit

Sometimes a value won't fit in the space allotted to its field on the screen. This may happen for several reasons:

- the field may be **larger** than the width of the screen (78 characters)
- you may have used **Image/ColumnSize** to **narrow** the field on the screen
- you may have used **Image/Format** to **reformat** the field on the screen.

Although these operations do not affect the values stored in the tables, they may affect their appearance on the screen. How they are displayed depends on their field type.

- If an alphanumeric (**A**) or date (**D**) value is too long to fit completely in the field, it will be **truncated** (cut off) at the field boundary.
- If a number (**N**, **$**, or **S**) value is too long to fit completely in the field, one of two things may happen:
  - If the field is too small to show all the whole digits (to the left of the decimal point) and formatted decimal digits (to the right) in the value, the field will be filled with **asterisks** (*).
  - If the value **can** be displayed except for unformatted decimal digits, it will be **truncated** at the field boundary.

You can tell when you've landed on a truncated field because the cursor will appear at the beginning of the field rather than at the end.

Using Field View

To view the hidden parts of a value, press Field View [Alt][F5] or [Ctrl][F] to enter the field. The cursor will become a box, and you can use [→], [←], [Ctrl][→], [Ctrl][←], [Home], and [End] to scroll through the field.

If you are viewing a word-wrapped field in a form, you can also use [↑] and [↓] to move between the lines of the field.

Viewing on a Network

When you view an image on a network, Paradox automatically places a prevent full lock on it. This is the least restrictive type of lock and allows other users simultaneous access to the table for all operations except those that require a full lock. See "Locking Objects" in Chapter 2 (Fundamentals) for a description of automatic locking.

On a network you may not be able to view an image you are interested in. This may happen for three reasons:

- Another user has placed a full lock on the table. This will prevent you from accessing the table, even to view it. You will have to wait until the lock has been removed before you can look at the table.
- Someone has placed a full lock on a form you want to use to view the table. You will have to wait until the lock has been removed before using the form.
- The owner of the table has protected the table from unauthorized access. You will have to present a valid password for the table before using it in any way.

Protected Fields

Although you are viewing a table, its owner might have protected one or more of its fields. You cannot view those fields unless you are given a password granting you access. The values in protected fields will appear to be blank.

See the description of the **Tools/More/Protect** selection in Chapter 10 (Tools) for complete information about protecting tables and fields.

Refreshing the Screen

On a network, others may be changing a table at the same time you are viewing it. Paradox allows you to choose the frequency with which these changes are shown on your screen. By default, they are shown every 3 seconds; however, if no one is making changes in the area of the table you are viewing, you may not see any updates for longer periods.

See the description of the **Tools/Net/Auto-Refresh** selection in Chapter 10 (Tools) for details on refreshing the screen.

Ask

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Get a query form to ask questions about a table.

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The **Ask** option on the Main menu is the heart of Paradox. This powerful facility is used to ask questions about, and to manipulate, the information in your Paradox tables.

The questions you ask about your database are called **queries**. You can ask questions of one table, or join two or more tables together in a single query. In a query, you can choose

- which **tables** contain the information
- which **fields** you want to display
- which **records** you want to select
- what **calculations** you want to perform.

You can also use queries to perform operations that find, change, add, or remove information. You can

- **insert** new records into a table
- **delete** records from a table
- **change** values in fields
- **find** records in a table.

In addition, you can use queries to define groups and sets of information within your tables and to perform calculations and comparisons on those sets. You can use queries in conjunction with Paradox's built-in crosstabs and graphing to easily discover trends and patterns in your data that are difficult to see when you simply view your tables.

The method you use to ask questions and perform query operations is called **query by example**. Instead of spending time figuring out how to do the query, you simply give Paradox an **example** of the results you're looking for. Paradox picks up the example and automatically seeks the fastest way of getting the answer or performing the operation.

Queries are flexible, interactive, and iterative. If a query doesn't quite obtain the results you want, you can easily fine-tune it and perform the query again. By constructing queries that build on each other, you can play "what if?" with your data.

You can also use queries to organize and summarize your data to produce more effective crosstabs and graphs. For details, see **Graph** in Chapter 8 (Image).

Query Forms

You compose a query by filling out **query forms** for the tables containing the information. When you choose **Ask** from the Main menu, Paradox will prompt you for a table name.

Displaying Query Forms

```
Table:
Enter name of table to ask about, or press ↵ to see a list of tables
```

Type the name of the table you want to query, or select it from a menu. You will see a query form for the table, containing all of its fields but no data. The query form for the sample *orders* table is shown below.

Repeat this process until you have displayed query forms for all the tables in your query. Your query may refer to as many tables at one time as can be accommodated by the memory in your computer configuration. There is no built-in limit to the number of tables that you can include in a single query.

Using Query Forms

Filling out a query form involves typing into its fields. The fields themselves are elastic; they can expand to hold up to 255 characters each. The reserved words and operators you can use are summarized in Table 4-1; each is described later in this chapter.

Making changes to a query form is very much like editing a table (see Chapter 7), but you don't have to enter a special edit mode to do so. You can [Backspace] to make changes from the end of a field, or press Field View [Alt][F5] to move the cursor within it.

Note that data display conventions, such as including whole number separators in numbers, may not be used on query forms.

All the query forms on the workspace at one time are active. Together they make up the **current query statement**, which is performed when you press Do-It! [F2]. You can use **Scripts/QuerySave** to save the current query statement in a script.

In the query result, by default, the fields you select are displayed in the sequence in which they ap-

```
ORDERS┬──Order #──┬──Cust ID──┬──Stock #──┬──Quant──┬──Date──┬──Emp #──┐
      │           │           │           │         │        │         │
```

Fields of *orders*

pear in the tables represented by the query forms. Pressing Rotate [Ctrl][R] to rearrange the fields of the query form, as described in Chapter 8 (Image), does **not** affect the order of fields in the result.

▶ You can make the *answer* table sensitive to the order of columns in the query form by running the Paradox Custom Configuration Program and selecting **Defaults/QueryOrder/ImageOrder**. Once you set **ImageOrder** as the default, the fields in *answer* are always displayed in the same order they appear on the query forms. You can then change the sort order of the *answer* by rotating columns in the query form. The possibilities are illustrated in Examples 4-4 and 4-14 later in this chapter.

ImageOrder is especially useful for graphs and crosstabs. However, it can cause compatibility problems for some operations such as **Tools/Copy/JustFamily** and **Tools/More/Add.** Changing the query sort order can also cause potential incompatiblities for applications developed in previous versions of Paradox. See the section on the CCP in Chapter 14 (Advanced Topics) for additional details and cautions.

Performing the Query

After you have filled out the query forms, press Do-It! [F2]. Paradox will perform the query with the tables you have specified.

The *Answer* Table

The result of your query is usually displayed in a table called *answer*.

Answer is a temporary table as described under "Paradox Objects" in Chapter 2 of this manual. It will be overwritten by a new *answer* table the next time you perform a query, and deleted when you leave Paradox. If you want to save the table, use **Tools/Rename** to rename it.

You can build one query on another by querying from *answer*. The new *answer* table will replace the old one.

Except for **find** queries and those using check plus √+ (described later in this chapter), the *answer* is sorted by the values in the fields from left to right.

Table 4-1. Query Summary

Category	Operator	Meaning
Reserved words	✓	display field in *answer*
	✓+	display field and include duplicate values
	✓▼	display field with values in descending order
	G	specify a group for set operators
	calc	calculate new field
	insert	insert new records with specified values
	delete	remove selected records from table
	changeto	change values in selected records
	find	locate selected records in a table
	set	define selected records as a set for comparisons
Arithmetic operators	+	addition or concatenation
	–	subtraction
	*	multiplication
	/	division
	()	group operators in a query expression
Range operators	=	equal to (optional)
	>	greater than
	<	less than
	>=	greater than or equal to
	<=	less than or equal to
Pattern operators	..	any characters
	@	any single character
Special operators	like	similar to
	not	does not match
	blank	no value
	today	today's date
	or	specify "or" conditions in a field
	,	specify "and" conditions in a field
	as	specify name of field in *answer*
	!	display all records in a field regardless of matches
Summary operators	average	average of values
	count	number of values
	max	highest value
	min	lowest value
	sum	total of the values
	all	calculate summary based on all values in group, including duplicates
	unique	calculate summary based on unique values in group only
Set comparison operators	only	display records that match only members of the defined set
	no	display records that match no members of the defined set
	every	display records that match all members of the defined set
	exactly	display records that match all members of the defined set and no others

Constructing Query Statements

With query by example, you make the query form look like an example of the information you're interested in. This involves indicating which **fields** you want to include in the *answer* table, and giving selection criteria to determine which **records** you want to include.

Selecting Fields

F6 **Checkmark**

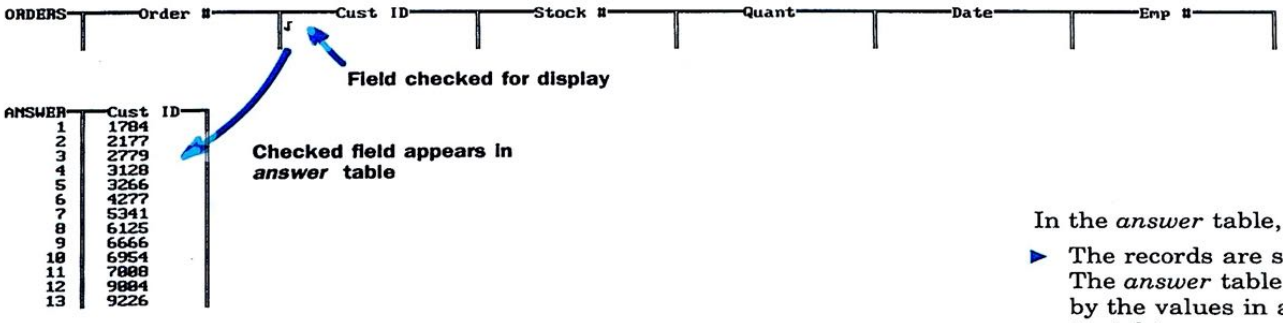
To select fields to appear in the *answer* table, just check them off on the query form. More precisely, move to each field and press Checkmark F6. A small **checkmark** (√) will appear on the form. The Checkmark F6 key is a toggle, so if you change your mind and do not want the field displayed after all, press it again and the checkmark will disappear.

To select **all** fields of the table, there is a shortcut. Move the cursor to the leftmost field and press Checkmark F6. Checkmarks will appear in all fields of the form. Again, you can press Checkmark F6 in the leftmost field again to remove all the checkmarks.

Checked fields normally have the same name in the *answer* table as they do on the query form. If you want a field to appear under a different name in the *answer*, just type **as** followed by the new name in the checked field. The *as* operator does not change the field name in the original table, only in *answer*.

4-1. Selecting Fields to Display

Suppose you want a list of customers who have placed orders. The figure shows a query form for the *orders* table with the *Cust ID* field checked for display. You can see the information in that field in the resulting *answer* table.



In the *answer* table, notice that:

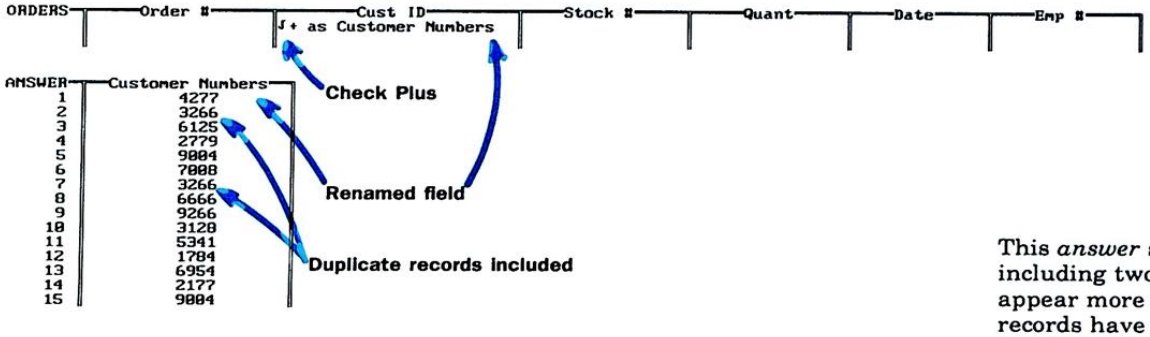
- The records are sorted by Cust ID. The *answer* table is normally sorted by the values in all fields from left to right.
- Although *answer* shows 13 customers, there are 15 values in the Cust ID field of *orders*. The two customers who placed more than one order have been listed *only* once. Duplicate records are normally omitted from the *answer* table.

Including Duplicate Records

If you want to see **every record** retrieved by the query, including duplicates, press Check Plus [Alt][F6] instead of Checkmark [F6]. A √+ symbol will appear. If there is a Check Plus in any field of a query, Paradox will include every record returned by the query in the *answer* table, regardless of duplications. When you use Check Plus, the records in the *answer* table are not sorted.

4-2. Including Duplicates and Renaming a Field

Now suppose you want a list of all customers who have placed orders, including duplicates. You can use Check Plus [Alt][F6] to indicate this on the *orders* query form. You can also rename the field in the *answer* table.



This *answer* shows 16 customers, including two whose ID numbers appear more than once. The duplicate records have been included. Note that when answer includes duplicates, the records are not sorted.

The *as* operator is used to rename Cust ID field Customer Numbers in the *answer* table.

Sorting Records in Answer

As you saw in Example 4-1, Paradox sorts records in the *answer* table on the basis of the values in its fields from left to right. That is, the records are first sorted by the values in the first field. Then, any ties are settled by the values in the second field, and so on.

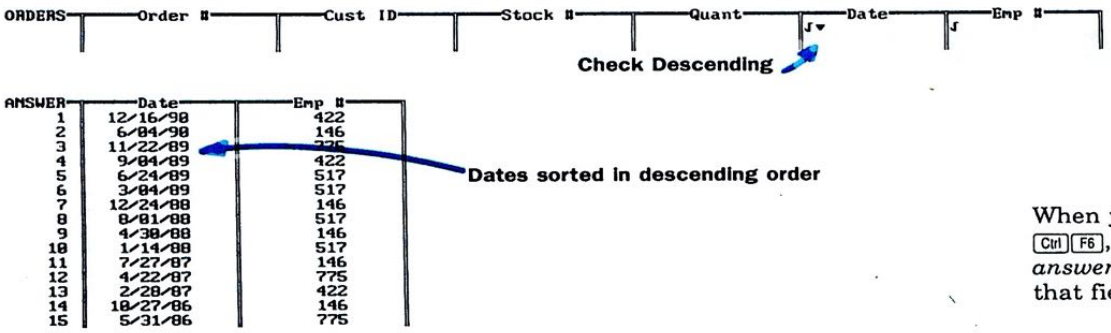
▶ This is true whether the fields in *answer* are based on their order in the tables or in the query forms. If you've chosen **Defaults/QueryOrder/ImageOrder** in the Custom Configuration Program, rotating the fields of the query forms can change their order in *answer*. Since sorting of records depends on field order, this could affect the order of the records.

Paradox normally sorts records by each field in **ascending** order, that is, from lowest to highest number, from earliest to latest date, or alphabetically from A to Z (or as appropriate for the sort order you've chosen).

You can also ask Paradox to sort selected fields in the *answer* table in **descending** order—from

4-3. Sorting the First Field in Descending Order

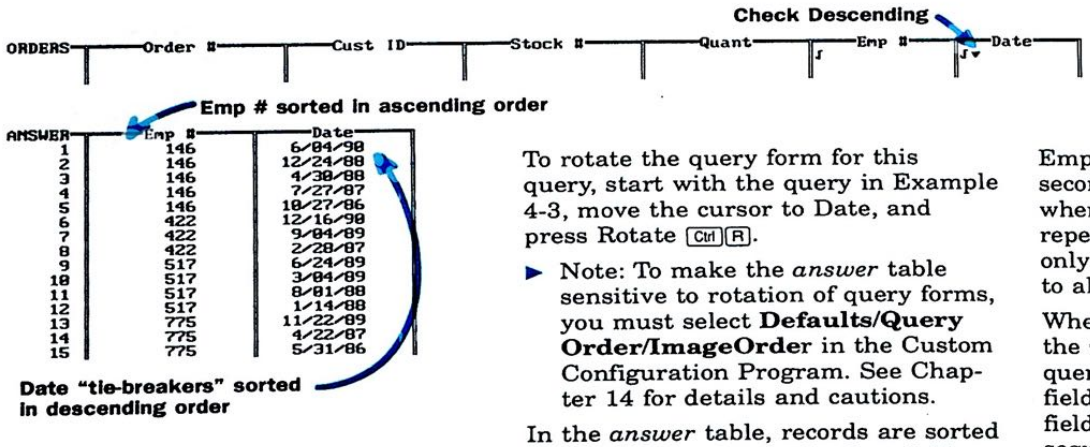
Suppose you want to list the date and salesperson for each order, with the most recent orders listed first.



When you press Check Descending [Ctrl][F6], Paradox sorts records in the *answer* table in descending order by that field.

4-4. Sorting the Second Field in Descending Order

Suppose you want the same information as in the previous example, but want to group each employee's orders together. To sort this way, rotate the query form so that the Emp # field appears first.



To rotate the query form for this query, start with the query in Example 4-3, move the cursor to Date, and press Rotate [Ctrl][R].

▶ Note: To make the *answer* table sensitive to rotation of query forms, you must select **Defaults/Query Order/ImageOrder** in the Custom Configuration Program. See Chapter 14 for details and cautions.

In the *answer* table, records are sorted in ascending order in the first field, Emp #, and in descending order in the second field, Date, to break "ties" where the same employee number is repeated. Check Descending applies only to fields where you specify it, not to all fields in the *answer* table.

When you've chosen **ImageOrder** in the CCP, the sequence of fields in the query form determines the sequence of fields in the answer table. Rotating fields in the query form changes the sequence of fields in *answer*.

highest to lowest, latest to earliest, or Z to A. Instead of pressing Checkmark [F6] to select a field, press Check Descending [Ctrl][F6]. The symbol ▼ appears next to the checkmark, indicating that the records will be sorted by that field in descending order.

Sorting in either ascending or descending order always removes duplicate records. Recall that when you use Check Plus [Alt][F6] to retain duplicate records, the records in *answer* are not sorted.

Selecting Records

In most cases, you are interested only in records that meet certain conditions. That is, you tell Paradox to display only those records that have certain values in one or more fields. Paradox gives you great flexibility in describing which rows you are interested in.

You can select records based on an exact match in a field (orders placed by customer #9004) or based on a range of values (orders for quantities greater than five). You can specify patterns with "wild card" characters (customers whose last names begin with *M* and end with *s*).

Using the *like* operator, you can look for inexact matches (customers with names *like Chen*). This is useful when you are unsure of the exact spelling or case of a name. You can also use it to detect spelling inconsistencies in a table—for example, to remove from a mailing list duplicate records that differ slightly in name or address.

You can also make selections based on calculations. Suppose you have an *employee* table that shows each employee's salary and manager. You could display the records of employees who make, say, less than half as much as their boss.

No matter how elaborate the question, you select the records of interest by filling out a query form (or forms) with an example of what you are looking for.

Exact Matches

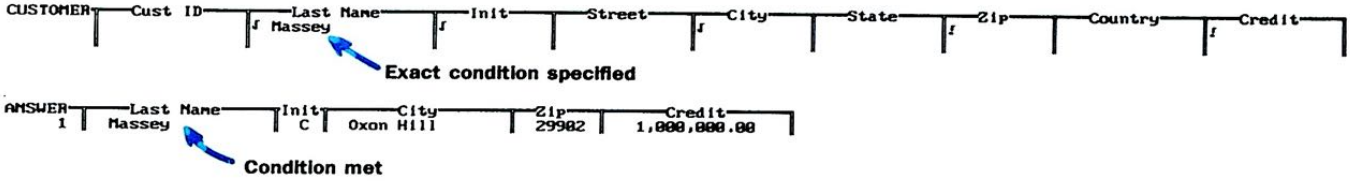
If you are interested in records that have a certain value in one of the fields—in a customer named *Massey*, or in anyone who bought exactly 1 of a particular item—simply type that value into the appropriate field.

Think of the query row as a pattern. Only the records that match the pattern are selected. You can enter values in as many fields as you wish.

When entering values, be careful to use the correct spelling and case. If you type **Massey**, and the value in the table is actually *Massy* or *MASSEY*, Paradox will not select the record. (You can use the pattern or *like* operators described later in this section if you are not sure about the spelling or case.)

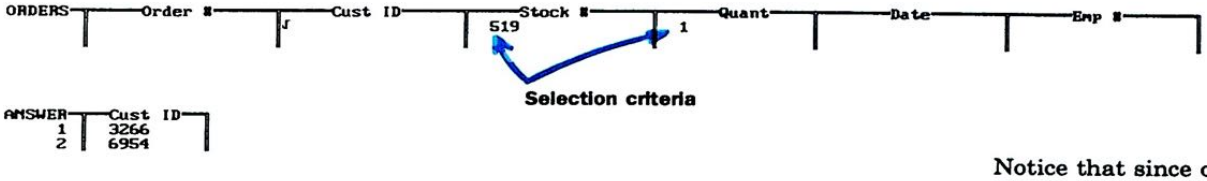
4-5. Selecting Records with an Exact Match

Suppose you want to get information about a customer named *Massey*.



4-6. Selecting Records that Match More than One Value

Suppose you want information about customers who placed orders for a single robot-valet *(Stock #519)*.



Notice that since only the Cust ID field is checked, Cust ID is the only field in the *answer* table.

If the value contains punctuation symbols, enclose it in double quotes, as in *"Barnum & Bailey"* or *"Smith, Harry"*. See "Using Quotation Marks" later in this section.

Ranges

Sometimes you want to select records that match a range of values. For example, you may want to display products which sell for more than $1,000, or orders placed between January 1 and June 30, 1987.

You can specify ranges on a query form by preceding a value with one of the **range operators**.

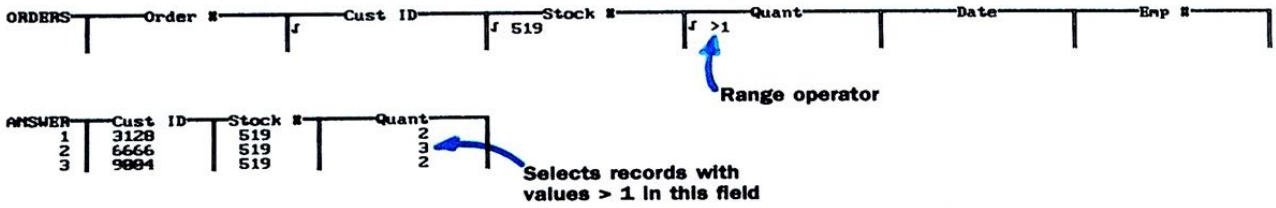
Range Operators

Operator	Meaning
=	**equal to (optional)**
>	**greater than**
<	**less than**
>=	**greater than or equal to**
<=	**less than or equal to**

Range operators can be used with any field type, alphanumeric, numeric, or date. For example, if you wanted to see the names of all customers whose last names start with a letter in the first half of the alphabet, you would type **< N** in the Name field of the *customer* query form. To display all orders placed since June 1, 1987, you would type **>= 6/1/87** in the Date field of the *orders* query form.

4-7. Selecting a Range

Suppose you want to know which customers have ordered more than one of the robot-valet (Stock #519). The range of values—*more than one*—is indicated by entering **>1** in the *Quant* field of the query form.



Patterns

Sometimes you want records to have character values that meet a certain pattern. For instance, you may not remember whether a customer's name was *Brown* or *Braun*; or you may know that a product description has *clock* in it somewhere but you're not sure where. To match a pattern, you can use one of Paradox's two **wild card operators**: **..** and **@**.

Series of Characters

The **..** wild card operator stands for a **series of any number of characters**, including no characters or blank spaces. For example, if you wanted to see information about customers whose names start with *W* and end with *r*, you could use the pattern **W..r**. This tells Paradox that you want to see those names that start with *W*, end with *r*, and which have any series of characters in between, like *Weidner* or *Walter*. The name could also include spaces (*Wilson Jr*, for example).

When you use a pattern, the case of what you type (capitals or lowercase) doesn't matter. You can type **w..r**, **W..R**, or **w..R**, and Paradox will obtain the same results.

Any combination of characters and dots is allowed. For example, the pattern **..s..n..** entered into the last name field of the *customer* table would match names such as *Smith-Jones*, *Simpson*, *Svenvald*, *Samuelson*, *Witherspoon*, *Sampson*, and *Hawes-Anderson*.

As you can see, because of the **..** before the *s*, Paradox finds any name containing *s* before *n*, whether or not the *s* begins the name or appears somewhere in the middle.

You can use the **..** pattern with any field type, so that you can find patterns for numbers and dates as well as alphanumeric values. For instance, depending upon the on-screen date format that is currently set, you could find all dates in June of 1988 by entering **6/../88**, **..Jun 88**, or **..".."06.88.** See "Dates and Numbers" later in this section for details.

Single Characters

The **@** wild card operator stands for **any single character**.

4-8. Matching a Series of Characters

Suppose you want to display the records of customers whose names begin with *H* and contain an *s*.

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
		H..s..							

Pattern

ANSWER	Cust ID	Last Name	City	State	Zip
1	4708	Harris	Atherton	CA	94322
2	5728	Helms	Cambridge	MA	02138
3	6125	Hawes-Anderson	Palm Springs	FL	32302

Condition met

4-9. Matching a Single Character

Suppose you want information about customers whose names are seven letters long, begin with *S*, and end with *n*. The pattern **S@@@@@n** matches names such as *Simpson* and *Sampson*.

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
		S@@@@@n							

Pattern

ANSWER	Cust ID	Last Name	City	State	Zip
1	8585	Sampson	Tiburon	CA	97992
2	9226	Simpson	Dallas	TX	75211

Condition met

Although you could use **S..n** to find these names, it would also find names of other lengths like *Samuelson*, *Swann*, *Singen*, and *Swerthington*.

Quotation Marks

To include **punctuation marks and other reserved characters** such as "*" in a pattern, enclose them in **double quotation marks**. For example, to match a currency value of $5 (and any number of cents), enter **5"."...** The first period (in quotes) is the decimal point, while the last two are the **..** wild card operator. For more information, see "Using Quotation Marks" later in this section.

Note that you can't combine ranges with a pattern, since such combinations would make no sense. For example, you can't match **> ..s..n** or **> = ..62**.

Dates

When entering date values for exact matches, you may use any of the three on-screen date formats—*mm/dd/yy*, *dd-Mon-yy*, or *dd.mm.yy*—in a query form. However, when you use a **pattern** with a date, the pattern must reflect the currently set on-screen date format (see Chapter 2 for information about the three available on-screen date formats).

```
PURCHASE┬──Quantity──┬─Date of Purchase─┬─Item Purchased──┬──
        │            │  ..Mar..         │                 │
```

In this instance, if the current date format is dd-Mon-yy typing **3..** as the pattern would not work. Note that you must construct the pattern according to the currently set date format even though you may have used the **Image/Format** selection to change the date format displayed in an image of the table.

Numbers

When you are entering numbers in a query form, never use whole number separators. This applies whether you are representing numbers in the U.S. or the international convention.

Thus, to see if any orders were placed for more than one million of any item, you would always use

```
                Correct
PURCHASE┬──Quantity──┬─Date of Purchase─┬─Item Purchased──
        │ ↓ >1000000 │ ↓                │ ↓
```

and **never**

```
PURCHASE┬──Quantity──┬─Date of Purchase─┬─Item Purchased──
        │ ↓ >1.000.000 │ ↓                │ ↓
```

or

```
                Incorrect
PURCHASE┬──Quantity──┬─Date of Purchase─┬─Item Purchased──
        │ ↓ >1,000,000 │ ↓                │ ↓
```

You can, of course, include the decimal point as a literal in a query. If you are displaying numbers using the international format (see "International Features" in Chapter 2), use the "," as a decimal separator just as you would use the "." in the U.S. format.

To include the decimal separator as a part of a **pattern**, you must enclose the separator in quotation marks. For example, to find all customers who ordered any quantity that included four-tenths of a unit, use this query:

```
PURCHASE┬──Quantity──┬─Date of Purchase─┬─Item Purchased──
        │ ↓ ..".4"   │ ↓                │ ↓
```

If you were using the international number convention the query would look like this:

```
PURCHASE┬──Quantity──┬─Date of Purchase─┬─Item Purchased──
        │ ↓ ..",4"   │ ↓                │ ↓
```

Inexact Matches: the Like Operator

A very powerful, unique capability of Paradox is the **like operator**, which lets you retrieve information even when you're not exactly sure what you're looking for. *Like* displays records that are **similar to**, but not necessarily the same as, a particular value.

Like is especially useful to detect case or spelling inconsistencies in tables. For example, a member of our staff was using Paradox to manage magazine subscriptions. One particular query displayed all the magazines except one—*Readers Digest*. After hours spent trying to figure out what was wrong, she realized that the entry in the table was *Reader's Digest*. Because of the missing apostrophe, the query didn't find an exact match and therefore didn't display the record.

The condition **like Readers Digest,** on the other hand, would have found the record. Moral: If your query doesn't get the results you expect, try using *like* to see if the problem might be a simple spelling or case error.

Non-Matches: the Not Operator

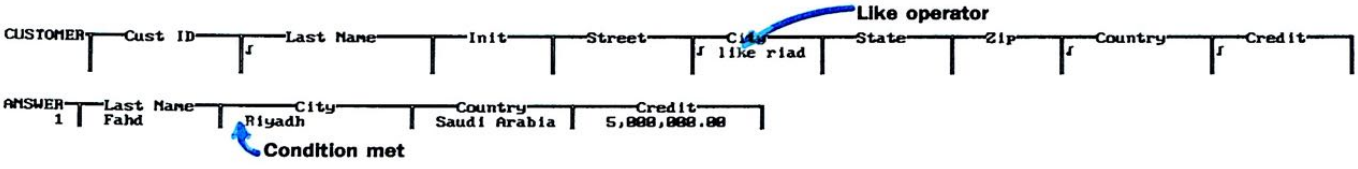
If you are interested in records that do not meet a certain condition, precede the selection criterion with the **not operator**. You can use *not* with exact matches, ranges, patterns, *like*, or any other kind of selection criterion.

Example 4-11 shows all of the **orders** whose stock # is not 519. Now suppose you wanted to see all of the **customers** who haven't ordered this product. You might be tempted to modify the query by simply checking the Cust ID field. But that wouldn't give you the right *answer* because *not* examines each record individually. So, a customer who ordered both # 519 and #558 would mistakenly be included in the *answer* (since #558 is indeed *not 519*).

There is a way to answer a question like this one that looks at more than one record at at time: Use the *no* operator instead of *not*. *No* and other Paradox **set comparision operators** are explained in "Working with Sets of Records" later in this chapter.

4-10. An Inexact Match

Suppose you want to find out information about customers who live in the capital of Saudi Arabia. You know it's pronounced *"Ree-ahd,"* but you can't remember how it's spelled. The selection criterion **like riad** will find the records you want.



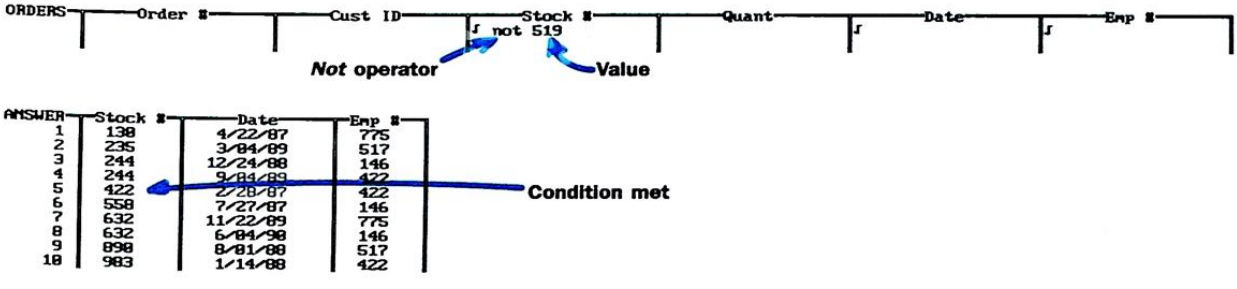
The condition **like riad** finds the record with the city you want, *Riyadh*. Note that you couldn't have used the pattern **R..d** to find *Riyadh*, since *d* isn't the last letter.

(By the way, Riyadh, Riyad, and Riad are all accepted alternate spellings of this city name. If you're not sure all the records in the table have used the same spelling, it's a good idea to use *like* whenever you query for this city.)

When you use *like*, the case (capitals or lowercase) of the letters you enter doesn't matter. However, you do have to match the first letter accurately. (In other words, **like Triad** would not match *Riyadh*.)

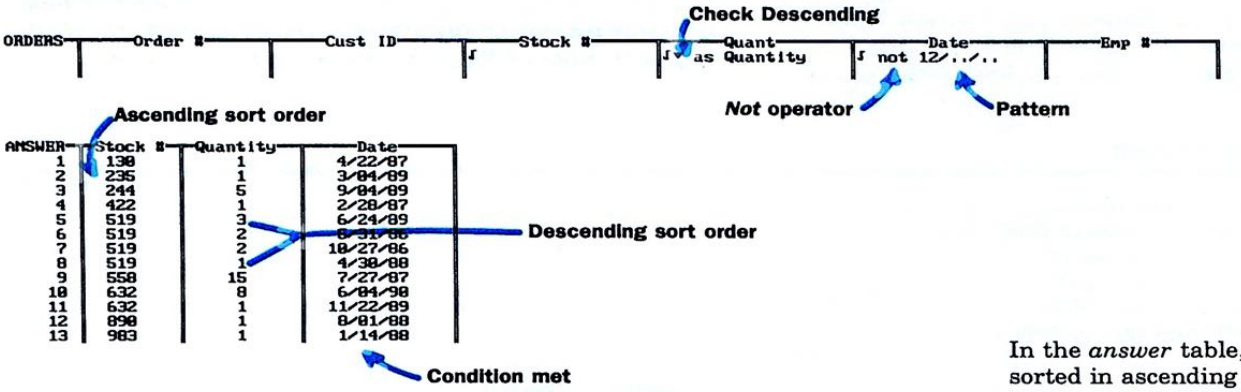
4-11. Selecting Records that Don't Match a Value

Suppose you want to know about orders for all products but the robot-valet (Stock #519).



4-12. Selecting Records that Don't Match a Pattern

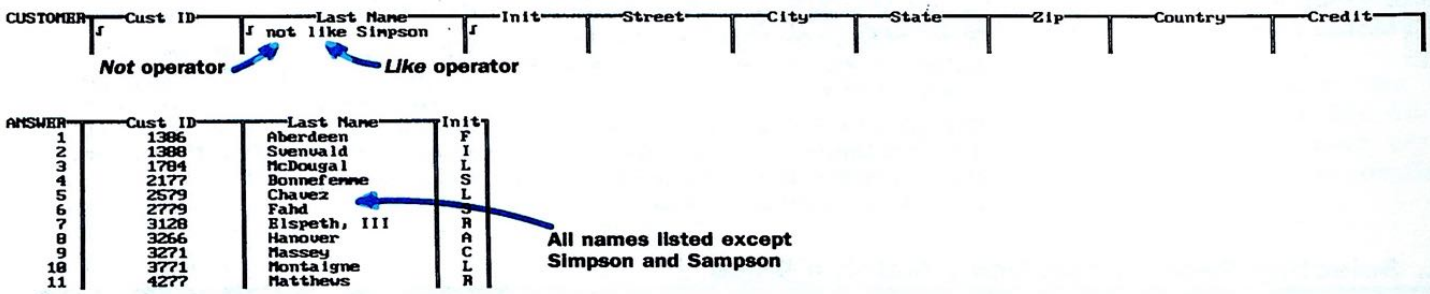
Suppose you want information about orders placed in any month but December. Since you're interested primarily in larger orders, within each product sort the records in descending order by Quant.



In the *answer* table, the records are sorted in ascending order by the first field, Stock #. Within each Stock #, √▼ lists the records in descending order by Quantity.

4-13. Selecting Records That Aren't Like a Value

Suppose you want information about customers whose names aren't like *Simpson*.



Blank Values: the Blank Operator

You may sometimes want to find records **without values** in one or more fields. Perhaps the blank value means that the field is not applicable (like a blank state entry for non-U.S. customers, or a blank commission for non-sales staff). Or perhaps you weren't able to fill in a value for certain records when you entered them, but are now prepared to do so.

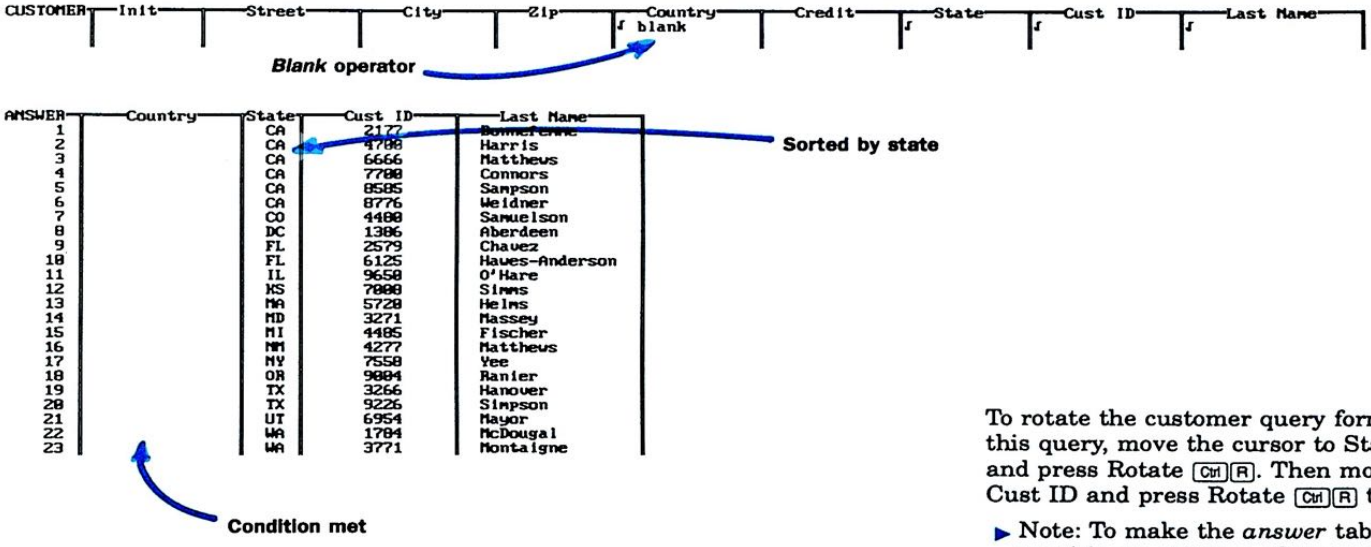
You can display those records in a table that contain a blank value in a particular field by typing the word **blank** into the field on the query form. The resulting *answer* table will contain only records with blank values in that field.

Similarly, you can display only those records that have non-blank values by typing **not blank** on the query form.

Entering **blank** on a query form is different from simply leaving the field empty. The *blank* operator says that you want records without values in that field, while leaving the field empty means you don't care what's in it. Note that when specifying queries using range operators, blanks are considered to be **less** than any other value.

4-14. Selecting Records with Blank Values

In the *customer* table, records for U.S. customers all have blank values in the Country field. Suppose you want to display their records, sorted by State. To sort this way, rotate the query form so that Country and State appear before other checked fields.



To rotate the customer query form for this query, move the cursor to State and press Rotate [Ctrl][R]. Then move to Cust ID and press Rotate [Ctrl][R] twice.

▶ Note: To make the *answer* table sensitive to rotation of query forms, you must select **Defaults/QueryOrder/ImageOrder** in the Custom Configuration Program. See Chapter 14 (Advanced Topics) for details and cautions.

Since all the records in *answer* have the same value (blank) in the first field, Country, they are sorted by the second field, State. Within each state, records are sorted by the third field, Cust ID.

Today's Date: the Today Operator

In date fields, the **today operator** always stands for **today's date**. In order for *today* to work correctly, your computer's calendar must be set properly. *Today* is especially useful for aging payables and receivables in conjunction with Paradox's arithmetic operators (see the next section on "Arithmetic Expressions").

Arithmetic Expressions

In number and date fields, you can use **arithmetic expressions** on a query form. That is, you can construct expressions with the arithmetic operators shown here:.

Arithmetic Operators

Operator	Meaning
+	**addition**
–	**subtraction**
*	**multiplication**
/	**division**
( )	**to group expressions**

Arithmetic operators are especially useful with the *today* operator, and with **example elements** as discussed in "Questions About More than One Table" later in this chapter.

You could use a query similar to the one in this example with a *payables* or *receivables* table to find out which accounts are more than 30 days old and, therefore, past due.

Date Arithmetic

Dates can be used in computational expressions. You can

- add a number (of days) to a date
- subtract a number (of days) from a date
- subtract a date from a date (results in number of days).

Concatenation of Values

In addition to its arithmetic function, the + operator can be used to combine (**concatenate**) alphanumeric values. See Example 4-39 later in this chapter for more information on this topic.

4-15. Selecting Records by Today's Date

Suppose today is June 24, 1988, and you want to display all orders placed before today.

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
		✓	✓		✓ <today	

Today operator

ANSWER	Cust ID	Stock #	Date
1	1784	983	1/14/88
2	3128	519	5/31/86
3	3266	558	7/27/87
4	4277	138	2/28/87
5	6954	519	4/30/88
6	9004	519	10/27/86
7	9226	422	4/28/87

Condition met

4-16. Selecting Records by Using an Arithmetic Expression

Suppose today is June 24, 1988, and you want to display all orders placed more than 90 days ago.

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
		✓	✓		✓ <today – 90	

Arithmetic operator

ANSWER	Cust ID	Stock #	Date
1	1784	983	1/14/88
2	3128	519	5/31/86
3	3266	558	7/27/87
4	4277	138	2/28/87
5	9004	519	10/27/86
6	9226	422	4/28/87

Condition met

Using Quotation Marks

If you want to enter an alphanumeric value that contains a **punctuation mark** or **reserved word**, enclose the value in **double quotation marks** (“). Paradox will recognize the quoted characters as a value and will not act on its special meaning.

Similarly, suppose you want to display information about a customer whose last name is *Blank*. If you simply type **Blank** on the query form, Paradox will display those records with a blank value (that is, with no value!) in the Last Name field. Instead, type **“Blank”** and Paradox will display the information you want.

Quotation marks are not needed to enclose blank spaces in a value. However, they are needed to enclose all other symbols that have special meanings in Paradox, including commas, periods, asterisks, and so on.

If the value itself contains a double quote, precede the quotation mark with a backslash (\ ), as in

“Margaret \“Hot Lips\” Houlihan”

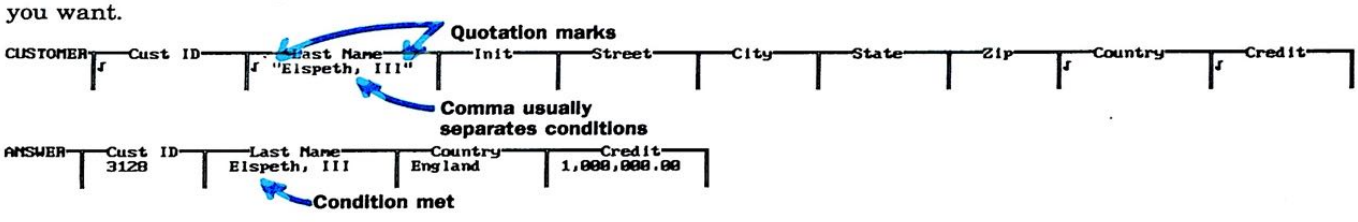
Similarly, if the value contains a backslash, precede the backslash with another backslash.

Two Conditions in the Same Field

If you want to enter more than one selection criterion in a field, and require that they all be met, separate them with commas as shown in Example 4-18.

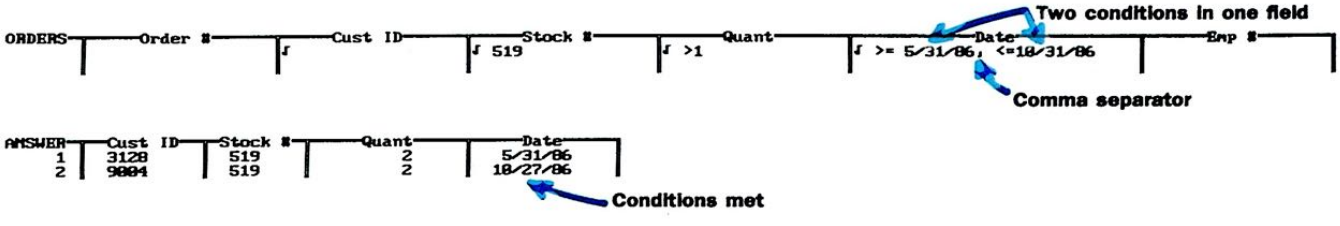
4-17. Using Quotation Marks

Suppose you want information about a customer named *R. Elspeth, III*. If you simply entered **Elspeth, III** in the *Last Name* field of the *customer* query form, Paradox would treat **Elspeth** and **III** as two separate values to match, and no record would be selected. You can use quotation marks to display the record you want.



4-18. Two Conditions in a Single Field

Suppose you want to know which customers ordered more than one of the robot-valet between May 31 and October 31, 1986.



Asking "Either-Or" Questions

You've already seen (in Example 4-6 and others) how to enter more than one query condition for records to meet. When you enter more than one selection criterion on the same line of a query form, the records must meet **all** of the criteria to be selected. Formally, this kind of requirement is called a **logical and** because the records must meet the first criterion **and** the second (and others, if there are any).

But sometimes you want to select records that meet **either** the first criterion **or** the second (or both). For example, you might want information about customers who live **either** in California **or** New York. Or you might want to know about which customers ordered either the robot-valet or the mink handkerchiefs (or both). This kind of requirement is sometimes called a **logical or**.

When you want the records in the query to meet any one (or more) of several conditions in the same field of the query, you can use Paradox's *or* operator. Simply type all the conditions for the field on the same line of the query form, with each condition separated by the word *or*, as shown in Example 4-19. Paradox will display all records matching any condition in the field.

There are some "or" conditions that you can't enter on a single line. If the conditions are in different fields, or if there is more than one set of conditions, you must enter the conditions on separate lines as shown in Example 4-20. When a query statement has several lines, Paradox will display all the records that match **any** line. You can still use the *or* operator to join conditions **within** each field.

You can enter up to 22 lines on a single query form. In general, all the lines must have the same fields checked for the query to work.

As usual, whether you use the *or* operator or state the condition on separate lines, duplicate records are eliminated from the *answer* table.

You can use the *or* operator with alternative conditions in more than one field on the same line. Suppose you want to see all customers who live in New York, California, or Florida, **and** who have credit limits of more than $1,000,000 or less than $500,000. You could use the *or* operator in both the State and Credit fields, and enter the query on one line.

You can use *or* with exact matches, ranges, patterns, *like*, or any other kind of selection criterion, but you may not use *or* with example elements used to link tables.

You can mix *and* and *or* questions in a single query as shown in Example 4-21.

4-19. "Or" Conditions in the Same Field

Suppose you want to know which customers ordered either the robot-valet (Stock #519) or the mink handkerchiefs (Stock #244), or both.

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
		✓	✓ 519 or 244			

Conditions on the same line, seperated by *or*

ANSWER	Cust ID	Stock #
1	3128	519
2	3266	519
3	5341	244
4	6666	519
5	6954	244
5	6954	519
6	9004	244
7	9004	519

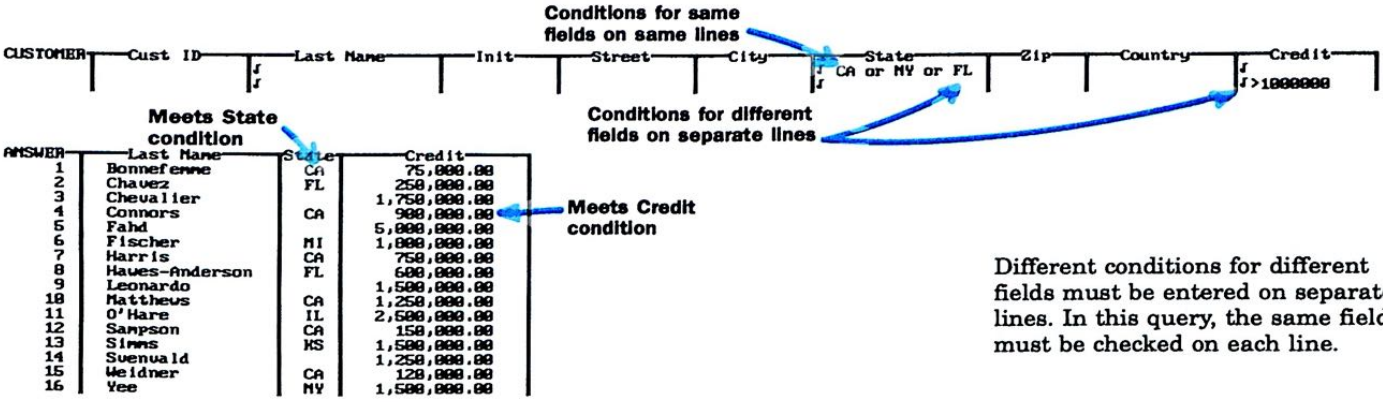
Both conditions met

Note that customer #9004, who meets both conditions, is twice included in the *answer*.

4-20. "Or" Conditions in Different Fields and on Different Lines

Suppose you want information about customers who either

- live in California, New York, or Florida, **or**
- have a credit limit of more than $1,000,000.

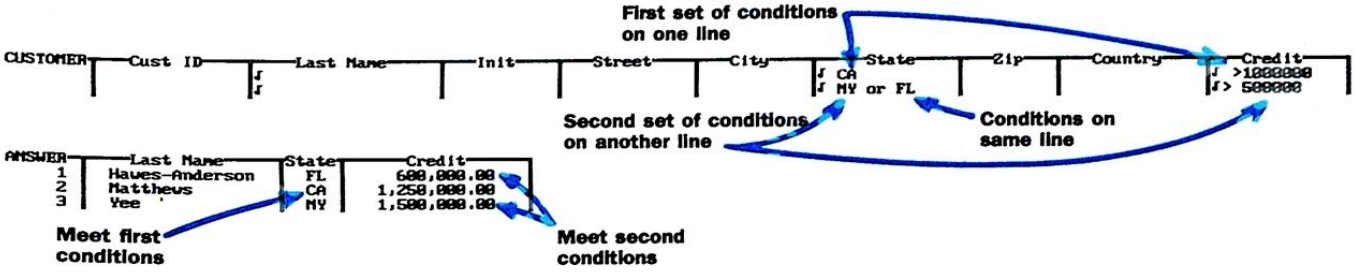


Different conditions for different fields must be entered on separate lines. In this query, the same fields must be checked on each line.

4-21. "And" and "Or" Conditions in the Same Query

Suppose you want to know about customers who either

- live in *California* **and** have a credit limit of more than $1,000,000; **or**
- live in New York or Florida, **and** have a credit limit of more than $500,000



Since the Credit condition is the same for both New York and Florida, you can combine the two State conditions on one line using the *or* operator. Since the Credit condition for California is different, it must be entered on a separate line.

Questions About More than One Table

Querying from several tables is similar to querying from one table, except that

- you fill out a query form for **each** table
- you must use **example elements** to tell Paradox how the information in the tables should be linked.

Example Elements

Tables in a multiple query are linked by **common fields**, which must contain the same kind of information. For example, the sample *orders* and *customer* tables have common fields containing customer ID numbers (called *Cust ID* in both tables). The fields don't have to have the same name, but their field types do have to be compatible. To indicate the common fields to Paradox, you enter **example elements** in those fields on the query forms.

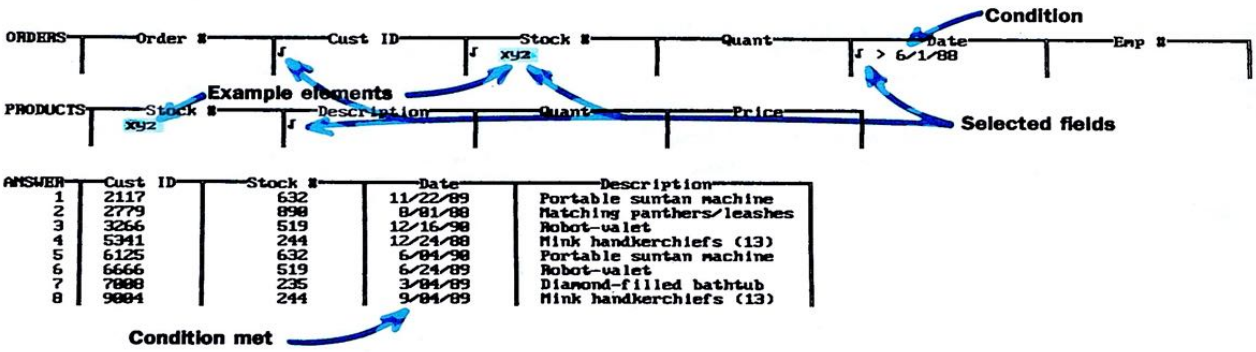
Example elements are extensions of Paradox's general query by example approach. Besides joining tables together, **example elements** allow you to join values together in the same table, perform calculations on values, insert new records based on old ones, and ask a variety of interesting questions about your data.

F5 **Example**

On a query form, an example element looks just like a value entered as a selection criterion, but it's highlighted or appears in a contrasting color. To enter an example element, press Example F5 and type the value. The highlight will appear as you type.

4-22. Linking Tables Together

Suppose you want a description of the items bought by each customer after June 1, 1988. The *orders* table tells what each customer bought, but lists the item only by Stock #. The *products* table gives a description of each item, but contains no order information. To answer the question, you need to combine information from both tables.



Since Stock # is the common field through which the two tables are joined, it contains the example element. In essence, Paradox selects a record from the *orders* table and checks the date to make sure it should be included. Then it looks at the field with the example element (Stock #) to see what item was ordered. Next it goes to the *products* table, looks for the field with the same example element (Stock #), and finds the record with the same value. Finally it retrieves the Description from the *products* table and joins the two records together in the *answer* table. The example element here—*xyz*—could just as easily have been *12* or *booo*.

In the *answer*, the checked fields from each table are displayed in the order in which their query forms appear on the workspace. Each table's fields appear by default in the order in which they appear in the table. However, you can make field order sensitive to rotation of fields in the query forms by choosing **Defaults/QueryOrder/ImageOrder** in the Custom Configuration Program. See Chapter 14 for details and cautions.

Example elements:

- must be made up of regular alphabetic characters (A-Z, capital or lowercase) or digits (0-9). No other characters can be used.
- cannot contain spaces.

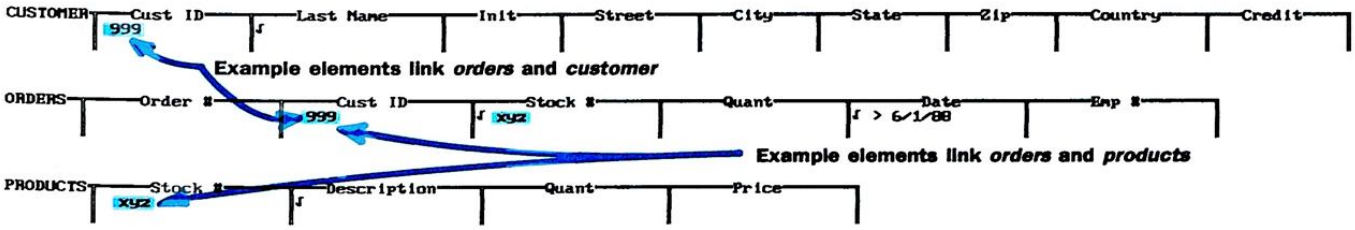
Within these restrictions, the value itself can be anything you like—*Mary* or *999* or *xyz* or *date*—as long as you use identical example elements in each field being linked.

An example element stands for a particular value selected from the table. For the purpose of linking tables together, example elements are "place markers" that say: *If a record selected from a table has a value in a certain field, it should be linked with all the records from another table that have the same value in a corresponding field.*

You may use example elements to link as many tables as you like, up to the number allowed by the memory in your computer configuration.

4-23. Linking Additional Tables

Suppose, instead of the customer ID number in Example 4-22, you want to list the customer's name. Since this information isn't in either *orders* or *products*, you must add the *customer* table to the query.



ANSWER

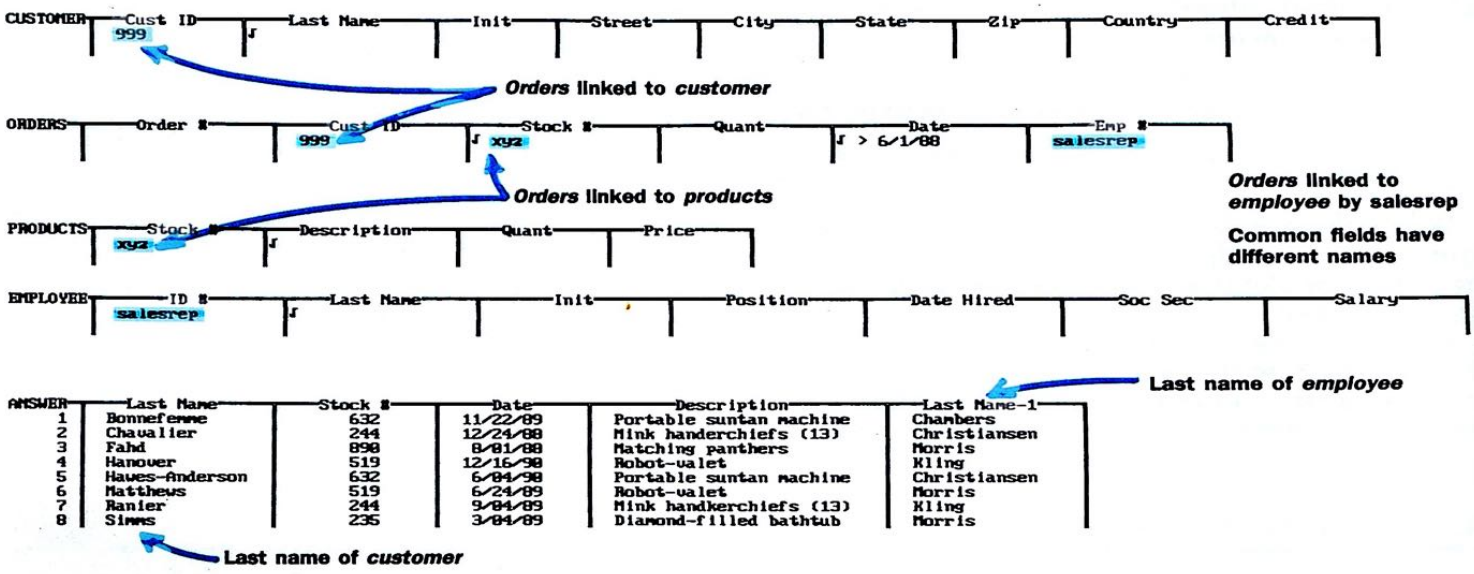
	Last Name	Stock #	Date	Description
1	Bonnefemme	632	11/22/89	Portable suntan machine
2	Chevalier	244	12/24/88	Mink handkerchiefs (13)
3	Fahd	898	8/01/88	Matching panthers/leashes
4	Hanover	519	12/16/98	Robot-valet
5	Hawes-Anderson	632	6/04/90	Portable suntan machine
6	Matthews	519	6/24/89	Robot-valet
7	Ranier	244	9/04/89	Mink handkerchiefs (13)
8	Simms	235	3/04/89	Diamond-filled bathtub

This shows how to use several sets of example elements in a single query: *xyz* joins the Stock # fields in *orders* and *products* (as before), while *999* joins the Cust ID fields in *orders* and *customer*.

Notice that you do not have to check (display) fields that contain example elements (like Cust ID) if you do not want to see them in the *answer* table.

4-24. Linking Still More Tables

Suppose, in addition to the information in Example 4-23, you also want to list the name of the salesperson who took the order. This information is in the *employee* table, which can be linked to *orders* through its Emp # field.



The example element *salesrep* joins the Emp # field in *orders* with the ID # field in *employee*. As this example shows, the linked fields do not have to have the same name.

Notice how Paradox ordinarily distinguishes two Last Name fields, one for *customer*, one for *employee*. You can use the *as* operator to specify a unique name for each field, as shown in Example 4-25.

Using Example Elements with Selection Conditions

When you use example elements to link tables, you can add as many selection criteria as you want. You may place query conditions in any query form, as long as that form is linked by example elements to the rest of the query statement.

As Example 4-25 illustrates, setting multiple criteria in querying from several tables is the same as for a single table.

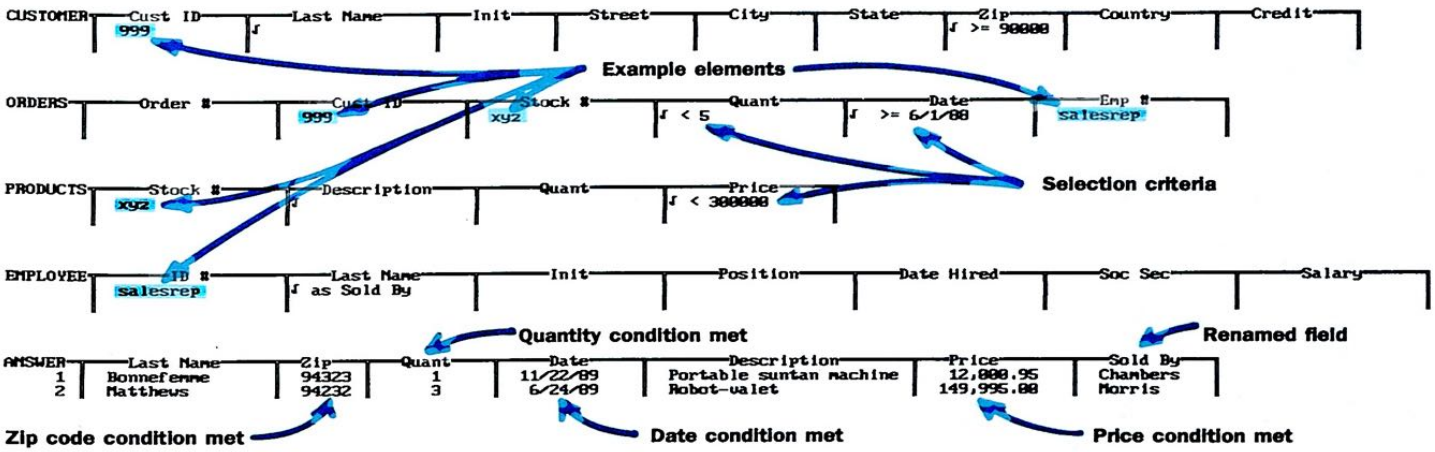
Asking "either-or" questions with multiple tables is also like asking them for a single table. You can use the *or* operator when you want to set alternative conditions in the same field, as shown in Example 4-26. "Or" conditions in different fields, or more than one set of *or* conditions, must be entered on separate lines (Example 4-27).

When entering example elements, make sure you link the correct lines. The *or* operator may **not** be used with example elements.

4-25. "And" Conditions with Linked Tables

Suppose you want to list the customer name, product description, and sales representative for all orders placed

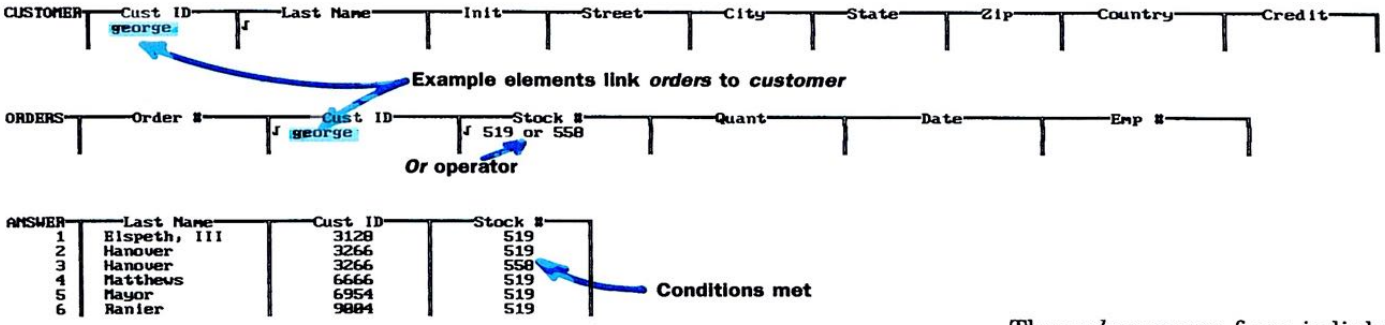
- since June 1, 1988
- by a customer from the west coast (zip code >=90000)
- for less than five of an item
- that sells for less than $300,000.



The *employee* query form contains the *as* operator to differentiate its Last Name field from the Last Name field of *customer*. Otherwise the second occurrence would appear as "Last Name-1" to prevent duplicate field names in a table, as Example 4-24 illustrates.

4-26. "Or" Conditions in One Field with Linked Tables

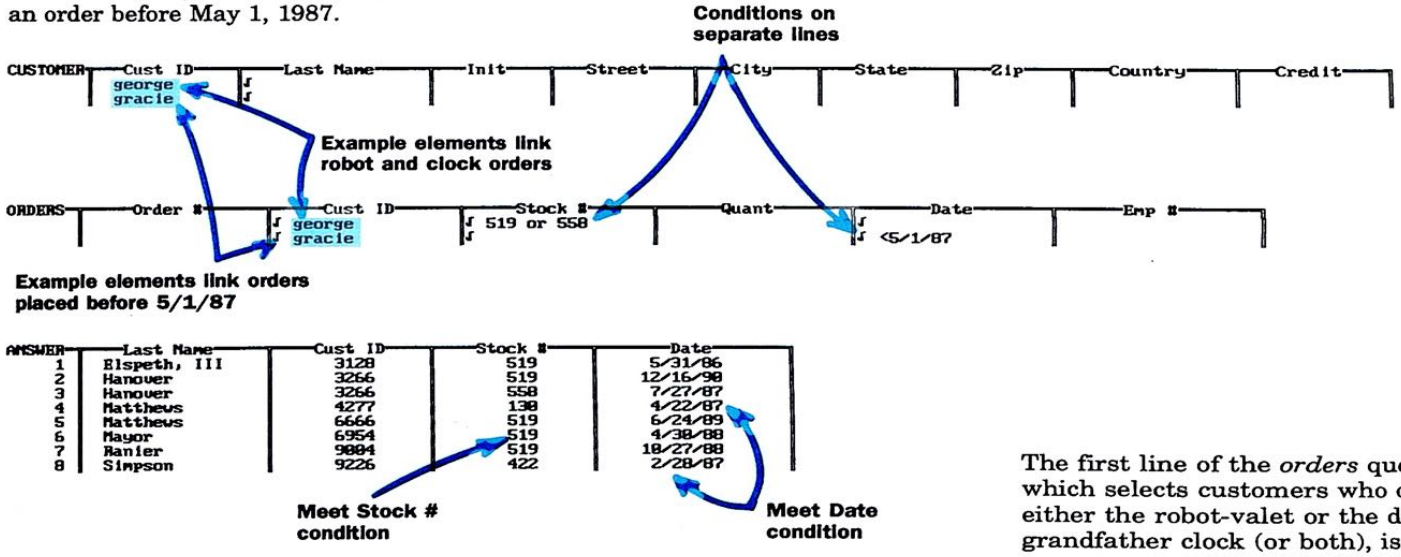
Suppose you want to list customers who have ordered either a robot-valet (Stock #519) or a digital grandfather clock (Stock #558), or both.



The *orders* query form is linked to the *customer* query form by the example element *george*. Any record that meets either condition (or both) will appear in the *answer* table.

4-27. "Or" Conditions in Different Fields with Linked Tables

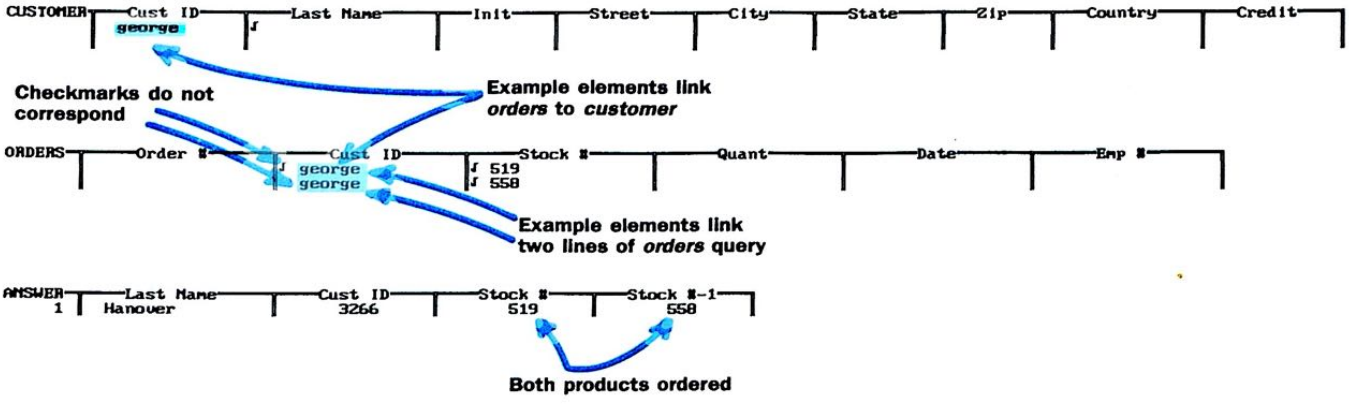
Suppose you want to list, in addition to customers who ordered the robot-valet or the clock, any customer who placed an order before May 1, 1987.



The first line of the *orders* query form, which selects customers who ordered either the robot-valet or the digital grandfather clock (or both), is linked to *customer* by the example element *george*. The second line, which selects customers who placed their orders before 5/1/87, is linked to *customer* by the example element *gracie*. Note that the checkmarks on each line must (and do) correspond.

4-28. Using Example Elements to Link Conditions

Example 4-26 listed customers who have ordered **either** the robot-valet **or** the digital grandfather clock (or both). Now suppose you want to list only customers who have ordered **both** the robot-valet **and** the clock.



In the *orders* part of the query, the first line selects orders for robot-valets, and the second line selects orders for the clock. But notice that a single example element, *george*, is used to link the two lines together. The example element says that the same customer must have ordered both items. Using the same example element on different lines of a query form turns an "or" query into an "and" query.

As usual, the same example element is used to link the resulting rows from *orders* to the corresponding rows in *customer*. Notice that when you use the same example element on different lines of a query form, you only need to check one of them to display the field.

This is the only case in which the checkmarks on different lines of a query form may differ. You do not have to duplicate checkmarks in linked lines of a query form; if you do, you will get extra fields in the *answer* table.

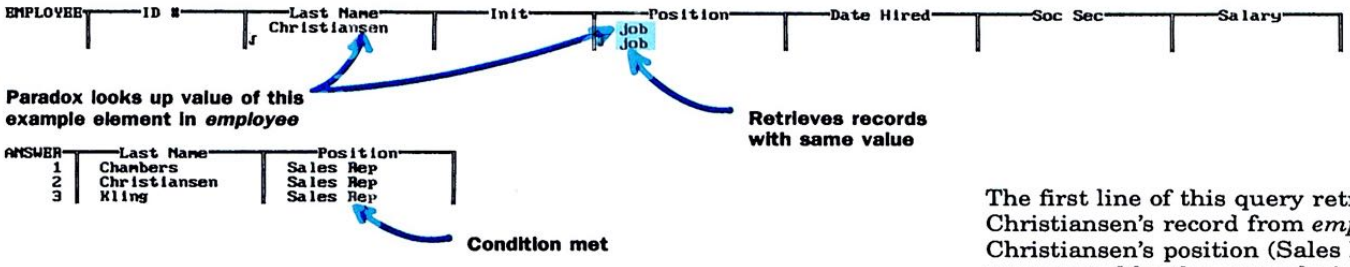
Using Example Elements in Selection Conditions

Example elements have many other uses besides linking tables and lines in a query. You can also use an example element in a selection criterion when the value you want to use is stored in a table. The example element stands for whatever value Paradox retrieves.

You can use example elements in ranges, patterns, arithmetic expressions, and any other kind of selection criterion.

4-29. Using an Example Element to Stand for a Value

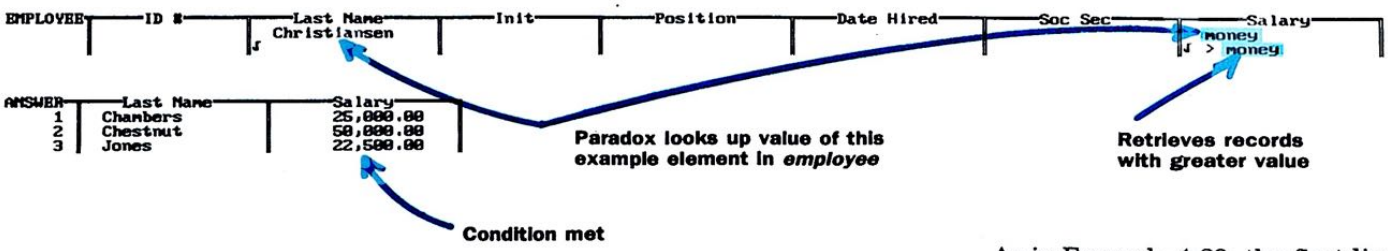
Suppose you want to list all the employees who have the same job as *Christiansen*. You could look up Christiansen's job in the *employee* table—or use an example element to let Paradox do it for you.



The first line of this query retrieves Christiansen's record from *employee*. Christiansen's position (Sales Rep) is represented by the example *job*. Then the same example element is used in the first line to retrieve all the records with that job.

4-30. Using an Example Element in a Range

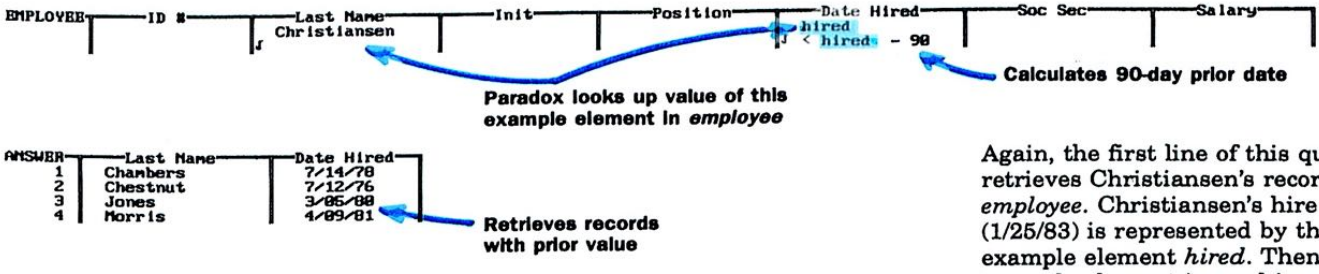
Suppose you want to list all the employees whose salary is higher than Christiansen's. You can use an example element with the > (greater than) operator.



As in Example 4-29, the first line of this query retrieves Christiansen's record from *employee*. Christiansen's salary ($20,000) is represented by the example element *money*. Then the same example element is used in the second line to retrieve all the records with a salary value greater than $20,000.

4-31. Using an Example Element in a Date Expression

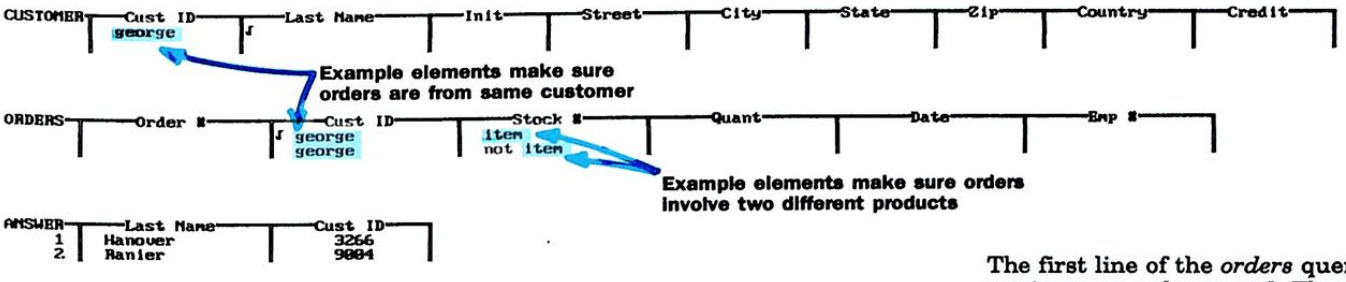
Suppose you want to list all employees hired more than 90 days before Christiansen was hired. You can use an example element to represent Christiansen's hire date, an arithmetic expression to calculate the date 90 days before, and the < (less than) operator to select the records you want.



Again, the first line of this query retrieves Christiansen's record from *employee*. Christiansen's hire date (1/25/83) is represented by the example element *hired*. Then the same example element is used in an arithmetic expression *(hired-90)* to calculate the date 90 days before, and the first line retrieves all the records with a hire date before that date.

4-32. Using an Example Element with *Not*

Suppose you want to list all the customers who have ordered two or more different products. You will need two example elements in this query from the *orders* table, one to represent the item ordered and one to represent the customer who ordered it.



The first line of the *orders* query form retrieves an order record. The example element *item* stands for the product ordered, while the example element *george* stands for the customer who ordered it. In the second line, which retrieves another record, *george* assures that the order is from the same customer, while *not item* assures that it is for a different product. Finally, *george* is used again to retrieve the customer's name from the *customer* table.

Linking to All the Records in a Table ("Outer Joins")

So far you've seen several queries that use example elements to link tables together. These queries are useful for retrieving all the records in one table that match records in another table.

The query in Example 4-33, for instance, shows all orders along with the customers who placed them. Due to the nature of example elements, the *answer* to this query includes data only on those customers who have placed orders. This is so because the example elements tell Paradox to look for **matching values** in *orders* and *customer* to determine which records to include in the *answer*.

4-33. Linking *Customer* and *Orders* and with Example Elements

Suppose you want a list of all orders and the customers who placed them.

Example elements in the common Cust ID field, which link *customer* with *orders*, tell Paradox to find matching values in the two tables. Since there are some customers who haven't ordered anything, they don't match records in *orders* and their names aren't included in *answer*. This kind of query is called an **exlusive link**, because it excludes those records that don't match.

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
	1234								

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
		1234				

***Answer* contains customers who have placed orders**

ANSWER	Last Name	Init	City	Order #	Stock #	Quant	Date
1	McDougal	L	Seattle	9226	983	1	1/14/88
2	Bonneferme	S	Stanford	1574	632	1	11/22/89
3	Fahd	S	Riyadh	6235	890	1	8/01/88
4	Elspeth, III	R	London	1180	519	2	5/31/86
5	Hanover	A	Dallas	3351	519	1	12/16/90
6	Hanover	A	Dallas	9554	558	15	7/27/87
7	Matthews	R	Albuquerque	2280	130	1	4/22/87
8	Chevalier	R	Montpelier	4492	244	3	12/24/88
9	Haves-Anderson	D	Palm Springs	8878	632	8	6/04/90
10	Matthews	J	San Francisco	6975	519	3	6/24/89
11	Mayor	K	Salt Lake City	7643	519	1	4/30/88
12	Simms	R	Topeka	5119	235	1	3/04/89
13	Ranier	T	Klamath Falls	1442	519	2	10/27/86
14	Ranier	T	Klamath Falls	3885	244	5	9/04/89
15	Simpson	H	Dallas	8933	422	1	2/28/87

Only matching records are included in *answer*

The Inclusion Operator

If you want an *answer* table that includes even those customers who haven't ordered anything, you can use Paradox's **inclusion operator** to set up an **inclusive link** between the two tables. In Example 4-33, an inclusive link for *customer* would tell Paradox to include all the records from *customer* in the *answer*, whether or not they match a record in *orders*.

To include all the customer records in the *answer* table, simply add the inclusion operator ! (an exclamation point) right after the example element **1234** as in Example 4-34. The inclusion operator always follows an example element, with no space between the two.

The ! in the query form for *customer* turns it into a kind of "master" table. This means that Paradox retrieves all of the records in the Cust ID field before linking any of them to records. *Orders*, meanwhile, serves as a "lookup" table from which only matching records are retrieved.

When it processes an inclusive link, Paradox retrieves the complete set of records from the master table before assembling other records that the link calls for. In this way you can be sure that all of the master records are included in the *answer* table.

A query with an inclusive link is sometimes called an **outer join** by database specialists. See "Advanced Query Information" later in this chapter for more information about using inclusive links in queries.

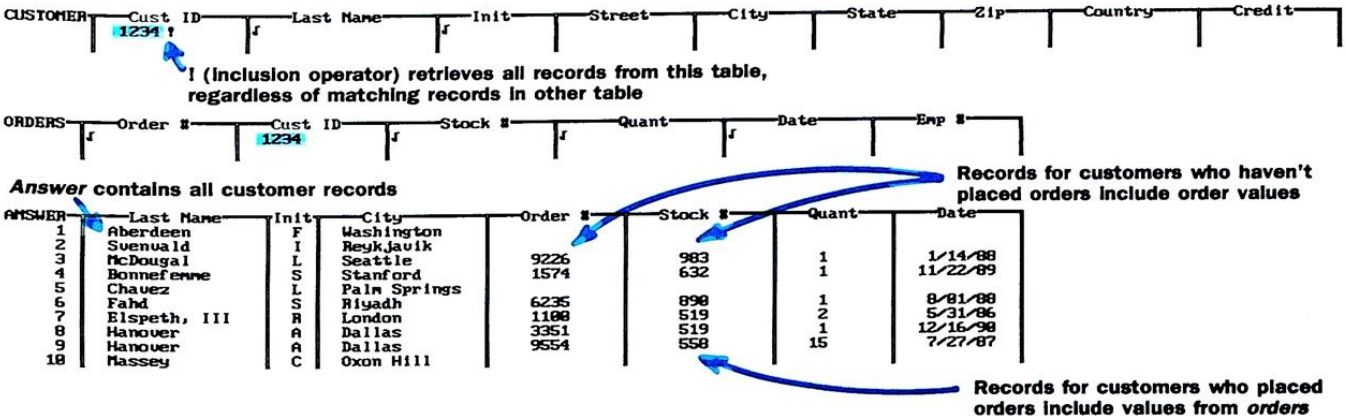
Selection Conditions with Inclusive Links

You can set selection conditions for the tables in a query that specifies an inclusive link just as you can with other queries. This allows you to fine-tune either the set of "master" records or the group of "lookup" records to be matched with them.

When Paradox processes an inclusive link, it first uses any selection conditions to determine the set of "master" records before linking them to the lookup table or performing other operations in the query. This is one of the few times in Paradox you need to think about the order in which a query is processed. Example 4-35 and 4-36 illustrate how the order of processing can make a difference in results.

4-34. Retrieving All the Records in a Linked Table

Suppose you want a list of all your customers and what, if anything, they've ordered.



This query is identical to Example 4-33 except for the inclusion operator in the Cust ID field of *customer*. But the ! allows you to catch information missed by the first query: customers who haven't ordered anything.

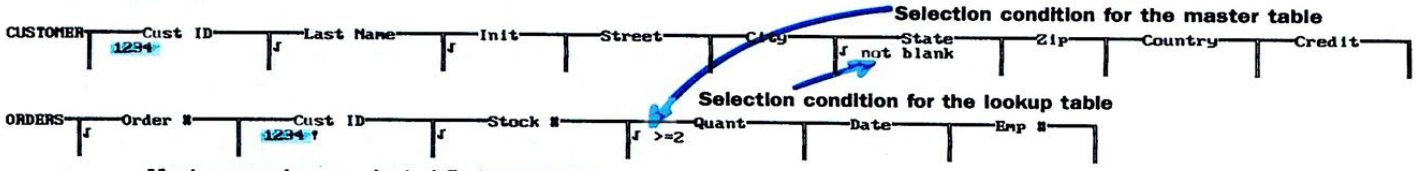
Another way to think about the inclusion operator is to say that it makes Paradox "assume" that each record in its table (in this case *customer*) has a matching record in the other table (*orders*). If it turns out there isn't actually a matching record in *orders*, Paradox still includes it in *answer* but leaves the matching field blank.

The only difference between Examples 4-35 and 4-36 is the placement of the inclusion operator, but that makes a big difference in the result. Selection conditions in the table with the ! are always processed first. So when *orders* is the master table, seven multi-item orders are selected; but when *customer* is the master, only five orders are retrieved—those that were placed by American customers. Similarly, when *customer* is the master table, 24 American customers are selected, but when *orders* is the master, only four customers are retrieved.

For more information on queries that use inclusive links, see "Advanced Query Operations" later in this chapter.

4-35. Selection Criteria When *Orders* Is the Master Table

Suppose you want a list of all orders for two or more of an item, and information about any American customers who have placed them.



Master records are selected first

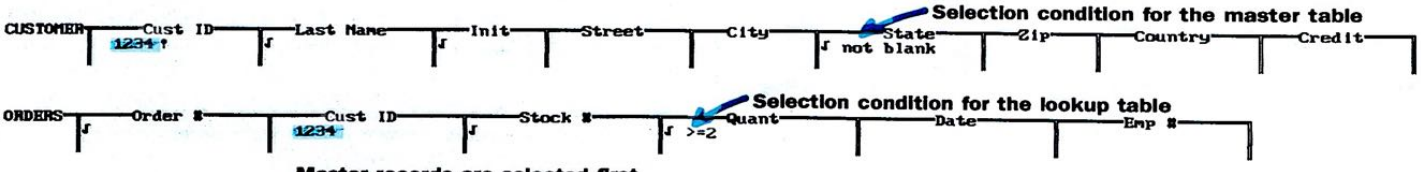
ANSWER	Last Name	Init	State	Order #	Stock #	Quant
1				1180	519	2
2				4492	244	3
3	Hanover	A	TX	9554	558	15
4	Hawes-Anderson	D	FL	8878	632	8
5	Matthews	J	CA	6975	519	3
6	Ranier	T	OR	1442	519	2
7	Ranier	T	OR	3885	244	5

Only lookup records that *both* match and meet the condition are displayed

Since the inclusion operator (!) is in *orders*, that's the master table. Paradox **first** retrieves all seven records that meet its selection condition (Quant = 2). **Then** Paradox also retrieves the four records from *customer* whose Cust ID numbers **both** match the selected master records, and meet **its** selection condition (State not blank). (One customer, who placed two multi-item orders, is listed twice.)

4-36. Selection Conditions When *Customer* Is the Master Table

Now suppose you want a list of all American customers and, for those who have ordered three or more of an item, what they've ordered.



Master records are selected first

ANSWER	Last Name	Init	State	Order #	Stock #	Quant
4	Connors	S	CA			
5	Fischer	R	MI			
6	Hanover	A	TX	9554	558	15
7	Harris	J	CA			
8	Hawes-Anderson	D	FL	8878	632	8
9	Helms	D	MA			
10	Massey	C	MD			
11	Matthews	J	CA	6975	519	3
12	Matthews	R	MN			
13	Mayor	K	UT			
14	McDougal	L	WA			
15	Montaigne	L	WA			
16	O'Hare	C	IL			
17	Ranier	T	OR	1442	519	2
18	Ranier	T	OR	3885	244	5
19	Raymond	S	ON			
20	Sampson	L	CA			
21	Samuelson	F	CO			
22	Simms	R	KS			
23	Simpson	H	TX			
24	Weidner	R	CA			
25	Yee	L	NY			

In this query, the inclusion operator (!) is in *customer*. That makes *customer* the master table, and since it contains no selection condition, Paradox retrieves all 24 of its American records first. Then it selects the five records from orders that **both** match a *customer* record and meet **its** selection criterion (Quant = 2). (Again, the customer who placed two multi-item orders is listed twice.)

Only lookup records that *both* match and meet the condition are displayed

Calculations

You are not limited to asking questions about the values in your tables. You can also use the keyword **calc** to perform calculations based on those values. You can use *calc* to

- construct and evaluate mathematical expressions
- combine values from two or more fields, and combine field values with constants.

For example, with *calc* you can calculate the total amount of each order in your *orders* table. Like the checkmark, *calc* creates a field in the *answer* table. Its values are calculated from values in the tables involved in the query.

By default, the calculated field's name is based on the calculation performed. You may want to use the *as* operator to rename it.

Normally, *each table's* calculated fields are placed at the end of its regular fields in the *answer*. However, if you've chosen **Defaults/QueryOrder/ImageOrder** from the Custom Configuration Program, *all* the calculated fields are placed at the end of *answer*.

In addition to calculating new fields for individual records, you can also use *calc* to count records and calculate sums, averages, minimums, and maximums of groups of records. For example, you can calculate the average credit limit of customers from each state in your *customer* table. For more information about these statistical calculations, see "Calculations on Groups of Records" later in this chapter.

Calculations on Individual Records

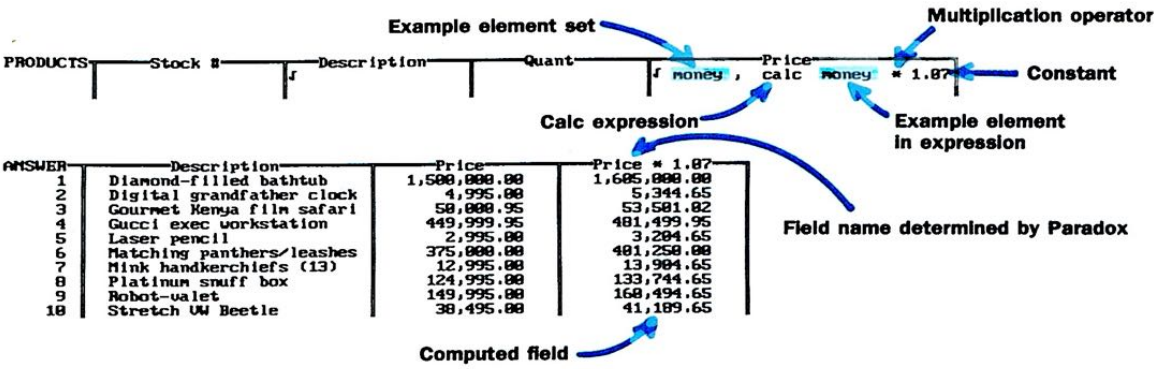
Suppose you want to know the amount of each order in the sample *orders* table. Since the *orders* table does not contain this information, you might be tempted to add a new field for it. You could then enter the amount for each order by multiplying the quantity ordered by the list price of the item from the *products* table.

Paradox can save you the work of performing all those calculations. When you use *calc* with individual records, Paradox adds a computed or derived field to the *answer* table and calculates the appropriate value for each record.

You could also use *calc* to project a price increase for all the items in the *products* table, raising current prices by 10%. Or, by including a selection criterion in your query, you could display the increased prices only for products that currently list below $100,000.

4-37. Calculating Values

This query shows how to find out what the list prices of all the items in the *products* table would be if current prices were raised by 7%.



Notice how the example element, *money*, is set in the Price field to represent the list price of each item. Then it is used in the formula *money * 1.07*. As usual, the two entries in this field are separated by a comma.

For each record, the formula multiplies the original list price by 1.07. Since *calc* always creates a new field in *answer*, there's no need to put a checkmark for it; the calculated field is displayed automatically. Also, you don't have to put the *calc* expression in the Price field; it could go anywhere.

Using *Calc* with Arithmetic Operators

You can type **calc** in any field of a query form; which field you choose doesn't matter. Following it, type the expression for the calculation you want to perform. In the expression you can use

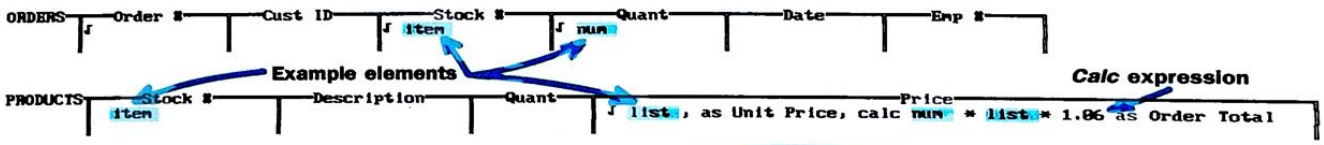
- **constant values**, like 1.1 or 7/16/85
- **example elements**, like 999
- **arithmetic operators** +, –, *, /, and ( ).

You can use parentheses ( ) to combine and group operations and indicate which calculations should be performed first. In expressions without parentheses, multiplication and division are performed before addition and subtraction. Operations with equal precedence are calculated left to right.

You can perform calculations on values from one table or from several. Note that if an example value in a record is blank, the *calc* field for that record will also be blank.

4-38. Calculating from More than One Table

Suppose you want to display the total amount of each order in the orders table, including 6% sales tax. You need to multiply quantity by list price, then add 6% (that is, multiply the result by 1.06). You'll probably want to rename the computed field as well.



Renamed fields

ANSWER	Order #	Stock #	Quant	Unit Price	Order Total
1	1180	519	2	149,995.00	317,989.40
2	1442	519	2	149,995.00	317,989.40
3	1574	632	1	12,000.00	12,720.00
4	2280	130	1	38,495.00	40,804.70
5	3351	519	1	149,995.00	158,994.70
6	3085	244	5	12,995.00	68,873.50
7	4492	244	3	12,995.00	41,324.10
8	5119	235	1	1,500,000.00	1,590,000.00
9	6235	890	1	375,000.00	397,500.00
10	6975	519	3	149,995.00	476,984.10
11	7643	519	1	149,995.00	158,994.70
12	8070	632	8	12,000.00	101,760.00
13	8933	422	1	124,995.00	132,494.70
14	9266	983	1	50,000.00	53,000.00
15	9554	558	15	4,995.00	79,420.50

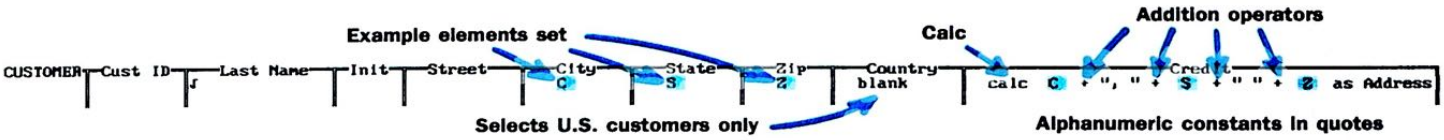
If you didn't add **as Order Total** to the *calc* expression, the computed field in the *answer* table would be named "Quant * Price * 1.06." Notice how both the base field and the calculated field are renamed by using two *as* operators in the same field.

Using *Calc* with Alphanumeric Values

You can concatenate (combine) alphanumeric values and constants by using the + operator. For example, you can combine parts of an address into a single field, or add ", Esq." to a list of attorneys' names.

4-39. Combining Alphanumeric Values

Suppose you want to combine the three address fields in the *customer* table—*City*, *State*, and *Zip Code*—into one new *Address* field for easy reference.



ANSWER	Last Name	Address
1	Aberdeen	Washington, DC 20032
2	Bonnefemme	Stanford, CA 94323
3	Chavez	Palm Springs, FL 32938
4	Connors	Belair, CA 90026
5	Fischer	Birmingham, MI 48011
6	Hanover	Dallas, TX 75043
7	Harris	Atherton, CA 94322
8	Haves-Anderson	Palm Springs, FL 32382
9	Helms	Cambridge, MA 02138
10	Massey	Oxon Hill, MD 29902
11	Matthews	Albuquerque, NM 87234
12	Matthews	San Francisco, CA 94232
13	Mayor	Salt Lake City, UT 84108
14	McDougal	Seattle, WA 98105
15	Montaigne	Bellevue, WA 98004
16	O'Hare	Chicago, IL 60542
17	Ranier	Klamath Falls, OR 97603
18	Sampson	Tiburon, CA 97992
19	Samuelson	Aurora, CO 89022
20	Simms	Topeka, KS 66104
21	Simpson	Dallas, TX 75211
22	Weidner	San Francisco, CA 94332

Computed field

In this formula, *C*, *S*, and *Z* are example elements representing city, state, and zip code respectively. The expression includes the constants "," and " " which separate the parts of the address in the computed field. Notice that these constants are enclosed in double quotes (") since they contain spaces and commas which otherwise would be interpreted differently.

Operations

The queries you have seen so far in this chapter simply display information on the screen. However, Paradox queries can perform other operations as well, as listed below.

Query Operations

Reserved Word	Function
insert	**insert new records with specified values**
delete	**remove selected records from a table**
changeto	**change values in selected records**
find	**locate selected records in a table**

The words *find*, *insert*, and *delete* must be placed in the leftmost field of a query form. The word *changeto* may be placed in any field but the leftmost.

You can combine several operations in a single query statement if you wish. If you do, all *deletes* are performed first, followed by all *changetos*, and then all *inserts*.

Insert

The word **insert** allows you to add new records to a table, based on a query. Suppose you have purchased a new mailing list and used **Tools/Export-Import** to import it into Paradox. You would now like to add the names and addresses to your *customer* table, but you can't use **Tools/More/Add** to do so since the new table does not have the same structure as *customer*. You certainly don't want to retype the new records! Instead, you can use *insert* to transfer the new information to the relevant fields of *customer*.

Insert queries usually make use of example elements. To set up an insert query, you fill out a query form for

- one or more **source tables** from which the information will be taken
- a **target table** to which the records will be added.

In the query forms for the source tables, use example elements to indicate the information that should be inserted. You may also enter selection criteria if you want to select only certain rows for insertion.

In the query form for the target table, type **insert** in the leftmost field. In the other fields, type expressions representing the values you want to insert. These expressions will usually contain the example elements you used in the source query, but they may also contain constants. Note that, unlike other kinds of queries, what you type in an insert query form are expressions for new values; they do not select records. Fields for which you enter no expressions will automatically be left blank.

When you execute an insert query, the records will be added to the target table; the source table will not be changed. You won't see the insertions unless the target table was displayed when you executed the query (you may **View** it if you want).

You will see a temporary table called *inserted* which contains the records that were inserted. You may use this table, along with the word *delete* or the **Tools/More/Subtract** option to undo the insertions if you wish. Remember that the *inserted* table will be overwritten the next time you execute an insert query, and erased when you leave Paradox.

4-40. Inserting Records

Suppose you have a table called *usmail* which has two fields, Name and Address. In *usmail* you want to insert records of your American customers from the sample *customer* table. The *Name* field in *usmail* must combine information from the Init and Last Name field in *customer*, while the Address field must combine City, State, and Zip.

Example elements **Selects U.S. customers**

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
		L	I		C	S	Z	blank	

Expressions

USMAIL Insert	Name	Address
	I + ", " + L	C + ", " + S + " " + Z

Insert **Alphanumeric constants**

USMAIL	Name	Address
1	F. Aberdeen	Washington, DC 20032
2	L. McDougal	Seattle, WA 98105
3	S. Bonnefemme	Stanford, CA 94323
4	L. Chavez	Palm Springs, FL 32930
5	A. Hanover	Dallas, TX 75043
6	C. Massey	Oxon Hill, MD 29902
7	L. Montaigne	Bellevue, WA 98004
8	R. Matthews	Albuquerque, NM 87234
9	F. Samuelson	Aurora, CO 89022
10	R. Fischer	Birmingham, MI 48011
11	J. Harris	Atherton, CA 94322
12	D. Helms	Cambridge, MA 02138
13	D. Haves-Anders	Palm Springs, FL 32302
14	J. Matthews	San Francisco, CA 94232

Combined addresses

Combined names

The *customer* query form uses a query condition to select American customers (for whom the Country field is blank), and example elements to extract the name and address components. The same examples, along with alphanumeric constants, +, and insert, are used on the *usmail* query form to distribute the information in the right fields.

Note that the figure shows the changed *usmail* table, assuming that it was displayed when the query was executed. We have not shown the inserted table here because it is the same as *usmail*.

Delete

The word **delete** allows you to remove selected records from a table. Although you can use **Modify/Edit** to delete records, *delete* is faster when the records are similar enough to meet a set of query conditions. *Delete* will remove only entire records, not specific values within them. (You can use *changeto* to change specific values to blanks.)

To set up a **delete query** type **delete** in the leftmost column of the query form for the table containing the records. In other fields on other linked query forms, enter the conditions to select the records to delete. If you enter no conditions, all the records will be removed from the table (although they may still be recovered if you change your mind).

When you execute a delete query, the records will be removed from the table. You won't see the revised table unless it was displayed when you executed the query (you may **View** it if you wish).

You will see a temporary table called *deleted* which contains the deleted records. The *deleted* table is your safety net in case you wish to recover the data. You may use it, along with *insert* or **Tools/More/Add**, to restore the deleted records if you wish.

Remember that the *deleted* table will be overwritten the next time you execute a delete query, and erased when you leave Paradox. At this time all the deleted records will be lost. If you want to keep them, use **Tools/Rename** to rename the *deleted* table before you exit or perform another delete query.

4-41. Deleting Records

Suppose you want to remove from the *orders* table all orders placed before January 1, 1988.

Delete

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
delete					< 1/1/88	

Selects orders before 1/1/88

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
1	3351	3266	519	1	12/16/90	422
2	8070	6125	632	8	6/04/90	146
3	1574	2177	632	1	11/22/89	775
4	3085	9004	244	5	9/04/89	422
5	6975	6666	519	3	6/24/89	517
6	5119	7008	235	1	3/04/89	517
7	4492	5341	244	3	12/24/88	146
8	6235	2779	890	1	8/01/88	517
9	7643	6954	519	1	4/30/88	146
10	9226	1784	983	1	1/14/88	517

DELETED	Order #	Cust ID	Stock #	Quant	Date	Emp #
1	1180	3128	519	2	5/31/86	775
2	1442	9004	519	2	10/27/86	146
3	2280	4277	130	1	2/28/87	775
4	8933	9226	422	1	4/28/87	422
5	9554	3266	558	15	7/27/87	146

***Deleted* table contains deleted records**

The query form uses a query condition to select orders placed before January 1, 1988. The word *delete* removes them from the *orders* table, but they are (temporarily) still in *deleted*.

Note that the figure shows the changed *orders* table, assuming that it was displayed when the query was executed.

Changeto

The word **changeto** lets you change values in a table based on conditions in a query. It is much like the global search and replace capability of many word processors, but *changeto* is even more powerful because it is selective as well as global, and it understands expressions. *Changeto* is especially useful when you want to change several values in a similar way.

To change records, type **changeto** in the field to be changed, followed by the new value or an expression representing it. Usually (unless you want to make the same change to all the records) you will want to include a selection criterion for the value to be changed, or an example element representing it to use in the *changeto* expression. You may also include selection criteria in other fields.

When you execute a **changeto query**, the records in the queried table will be changed. You won't see the changes unless the queried table was displayed when you executed the query (of course, you may **View** it if you wish).

You will see a temporary table called *changed* which contains a copy of the records as they were before you changed them. This table will help you verify that only the records you wanted to change were actually changed. If there are problems, you can delete the changed records from the queried table and use **Tools/More/Add** to merge the original, unchanged records from *changed* back into the queried table.

Remember that the *changed* table will be overwritten the next time you execute a *changeto* query, and deleted when you leave Paradox. At this time the copy of the original, unchanged records will be lost. If you want to keep them, use **Tools/Rename** to rename the *changed* table before you exit or perform another *changeto* query.

4-42. Changing Records

Suppose you have changed the title of your sales staff from *Sales Rep* to *Customer Agent*. You want this change to be reflected in the *employee* table.

New value

EMPLOYEE	ID #	Last Name	Init	Position	Date Hired	Soc Sec	Salary
				Sales Rep, changeto Customer Agent			

Selection criterion ***Changeto***

EMPLOYEE	ID #	Last Name	Init	Position	Date Hired	Soc Sec
1	146	Christiansen	S	Customer Agent	1/25/83	232-08-9671
2	395	Chestnut	R	Dept Mgr	7/12/76	799-21-9825
3	422	Kling	W	Customer Agent	3/31/85	765-21-8569
4	517	Morris	T	Telephone Sales	4/09/81	183-77-2648
5	537	Lee	Y	Secretary	12/01/82	999-68-1247
6	775	Chambers	M	Customer Agent	7/14/78	790-72-8524
7	980	Jones	L	Admin Asst	3/05/80	399-13-4275

New titles

CHANGED	ID #	Last Name	Init	Position	Date Hired	Soc Sec	Salary
1	146	Christiansen	S	Sales Rep	1/25/83	232-08-9671	20,000.00
2	422	Kling	W	Sales Rep	3/31/85	765-21-8569	18,000.00
3	775	Chambers	M	Sales Rep	7/14/78	790-72-8524	25,000.00

Changed table contains original records

In the Position field, the value *Sales Rep* selects the records of sales representatives. The *changeto* expression replaces the previous value with *Customer Agent*.

Note that the figure shows the changed *employee* table, assuming that it was displayed when the query was executed.

4-43. Changing Records with Example Elements

Example 4-37 showed how to project a 7% increase in the price of items in the *products* table, but that query did not actually change the values in the *Price* field. Suppose you want to make the changes as follows:

- increase the price by 7% for products that currently list for less than $100,000
- increase the price by 12% for products that currently list for $100,000 or more.

Example elements **_Changeto_ expressions**

PRODUCTS	Stock #	Description	Quant	Price
				< 100000, price , changeto price * 1.07
				>= 100000, list , changeto list * 1.12

PRODUCTS	Stock #	Description	Quant	Price
1	632	Portable suntan machine	350	12,841.02
2	130	Stretch VW Beetle	3	41,189.65
3	235	Diamond-filled bathtub	1	1,680,000.00
4	244	Mink handkerchiefs (13)	13	13,904.65
5	422	Platinum	88	139,994.40
6	519	Robot-va	50	167,994.40
7	558	Digital grandfather clock	266	5,344.65
8	890	Matching panthers/leashes	3	420,000.00
9	983	Gourmet Kenya film safari		53,501.02
10	209	Gucci exec workstation	19	503,999.94

Values raised 12%

Values raised 7%

CHANGED	Stock #	Description	Quant	Price
1	632	Portable suntan machine	350	12,000.95
2	130	Stretch VW Beetle	3	38,495.00
3	235	Diamond-filled bathtub	1	1,500,000.00
4	244	Mink handkerchiefs (13)	13	12,995.00
5	422	Platinum snuff box	88	124,995.00
6	519	Robot-valet	50	149,995.00
7	558	Digital grandfather clock	266	4,995.00
8	890	Matching panthers/leashes	3	375,000.00
9	983	Gourmet Kenya film safari		50,000.95
10	209	Gucci exec workstation	19	449,999.95

Changed table contains original records

There are two lines in the query, corresponding to the two categories of records you want to select. In each line, the Price field contains the selection condition and sets an example element, then uses the same example element in the *changeto* formula.

Find

Find queries allow you to use query by example to locate records or groups of records in a table. Though you can use **Image/Zoom/Value** or Zoom [Ctrl][Z] to quickly move the cursor to a particular record, the search keys you can employ with these features are limited to the values in only one field. In contrast, **find queries** allow you to use elaborate selection criteria based on several fields or even several tables to search for the records you want.

To find records, type **find** in the leftmost field of the query form. Then enter the conditions you want the records to meet as described under "Selecting Records" earlier in this chapter.

When you perform a **find query**, three things will happen differently from other sorts of queries:

- the table that appears on the screen will be the table you queried (not *answer*), and the cursor will be on the first record that meets the query conditions. The cursor will flash momentarily to highlight the selected record.
- Any records that meet the condition will be placed in the *answer* table. Although *answer* will not be automatically displayed, you may **View** it if you wish.
- The records in *answer* will be arranged in the same order as they appear in the queried table, not in sorted order.

Note that the Checkmark [F6] and group operators do not work in *find*.

4-44. Finding Records

Suppose you want to edit the record of a customer named *Yee*. You could use the **Image/Zoom/Value** selection or Zoom [Ctrl][Z], or you could use the following find query.

Find **Query condition**

CUSTOMER	Cust ID	Last Name	Init	Street	State	Zip
find		Yee				

Customer **table displayed**

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
1	1306	Aberdeen	F	45 Utah Street	Washington	DC	20032		50,000.00
2	1308	Svenvald	I	Gouvernment House	Reykjavik			Iceland	1,250,000.00
3	1784	McDougal	L	4950 Pullman Ave NE	Seattle	WA	98105		150,000.00
4	2177	Bonnefemme	S	128 University Drive	Stanford	CA	94323		75,000.00
5	2579	Chavez	L	Cypress Drive	Palm Springs	FL	32938		250,000.00
6	2779	Fahd	S	The Palace	Riyadh			Saudi Arabia	5,000,000.00
7	3128	Elspeth, III	R	1 Hanover Square	London			England	1,000,000.00
8	3266	Hanover	A	15 State Street	Dallas	TX	75043		750,000.00
9	3271	Massey	C	29 Aragona Drive	Oxon Hill	MD	29902		1,000,000.00
10	3771	Montaigne	L	30 Tauton Drive	Bellevue	WA	98004		450,000.00
11	4277	Matthews	R	P. O. Box 28336	Albuquerque	NM	87234		50,000.00
12	4335	Farouk	K	Hotel Cairo	Cairo			Egypt	250,000.00
13	4480	Samuelson	F	Bull Run Ranch	Aurora	CO	89022		600,000.00
14	4485	Fischer	R	14 Willow Lane	Birmingham	MI	48011		1,000,000.00
15	4589	Leonardo	D	198 Via Canales	Rome			Italy	1,500,000.00
16	4700	Harris	J	Old Country Road	Atherton	CA	94322		750,000.00
17	4804	Anders	B	Jaktstigen 42	Lidingo			Sweden	300,000.00
18	5341	Chevalier	R	392 Boulevard Raspil	Montpelier			France	1,750,000.00
19	5720	Helms	D	52 Brattle Street	Cambridge	MA	02138		85,000.00
20	5855	Chin	F	Hotel Orient	Jurong			Singapore	150,000.00
21	6125	Haves-Anderson	D	Waves Cottage	Palm Springs	FL	32302		600,000.00
22	6666	Matthews	J	1050 12th Street	San Francisco	CA	94232		1,250,000.00
23	6954	Mayor			Salt Lake City	UT	84108		100,000.00
24	7000	Simms			Topeka	KS	66104		1,500,000.00
25	7550	Yee_	L	2938 42nd Street	New York	NY	10032		1,500,000.00
26	7640	Raymond	S	398 Centre Street	Winnipeg	OM		Canada	500,000.00
27	7700	Connors	S	27 Portfolio Drive	Belair	CA	90026		900,000.00
28	8505	Sampson	L	29 Buena Vista Drive	Tiburon	CA	97992		150,000.00
29	8776	Weidner	R	56 Santa Ysbel	San Francisco	CA	94332		120,000.00
30	8996	Smith	J	Hotel Americain	Paris			France	1,000,000.00
31	9004	Ranier	T	8947 San Andreas	Klamath Falls	OR	97603		125,000.00
32	9226	Simpson	H	3 Pooks Hill	Dallas	TX	75211		75,000.00
33	9650	O'Hare	C	1 Airport Drive	Chicago	IL	60542		2,500,000.00

Cursor in Yee's record

Notice that *customer* (not *answer*) is displayed, and the cursor is in the record you selected. If you want to edit that record, simply press **Edit** [F9]

4-45. Finding Records in Linked Tables

Suppose you want to find the records of customers who have ordered the robot-valet (Stock #519). Since the order information is in *orders* while the customer records are in *customer*, you will need to link these two tables in the query. Note that you could not use **Image/Zoom/Value** or Zoom Ctrl Z to find these records

Find **Example elements link tables**

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
find	1234								

Query condition

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
		1234	519			

All selected records in *answer*

ANSWER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
1	3266	Hanover	A	15 State Street	Dallas	TX	75043		750,000.00
2	9004	Ranier	T	8947 San Andreas	Klamath Falls	OR	97603		125,000.00
3	6666	Mattheus	J	1050 12th Street	San Francisco	CA	94232		1,250,000.00
4	3128	Elspeth, III	R	1 Hanover Square	London			England	1,000,000.00
5	6954	Mayor	K	48 Winding Way	Salt Lake City	UT	84108		100,000.00

Customer **table displayed**

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
1	1306	Aberdeen	F	45 Utah Street	Washington	DC	20032		50,000.00
2	1308	Svenvald	I	Gouvernment House	Reykjavik			Iceland	1,250,000.00
3	1704	McDougal	L	4950 Pullman Ave NE	Seattle	WA	98105		150,000.00
4	2177	Bonnefemme	S	Cursor in first	Stanford	CA	94323		75,000.00
5	2679	Chavez	L		Palm Springs	FL	32930		250,000.00
6	2779	Fahd	S	selected record	Riyadh			Saudi Arabia	5,000,000.00
7	3128	Elspeth, III	R	1 Hanover Square	London			England	1,000,000.00
8	3266	Hanover	A	15 State Street	Dallas	TX	75043		750,000.00
9	3271	Massey	C	29 Aragona Drive	Oxon Hill	MD	29902		1,000,000.00
10	3771	Montaigne	L	38 Tauton Drive	Bellevue	WA	98004		450,000.00
11	4277	Mattheus	R	P. O. Box 28336	Albuquerque	NM	87234		50,000.00
12	4335	Farouk	K	Hotel Cairo	Cairo			Egypt	250,000.00
13	4480	Samuelson	F	Bull Run Ranch	Aurora	CO	89022		600,000.00
14	4485	Fischer	R	14 Willow Lane	Birmingham	MI	48011		1,000,000.00
15	4589	Leonardo	D	198 Via Canales	Rome			Italy	1,500,000.00
16	4708	Harris	J	Old Country Road	Atherton	CA	94322		750,000.00
17	4884	Anders	B	Jaktstigen 42	Lidingo			Sweden	300,000.00
18	5341	Chevalier	R	392 Boulevard Raspil	Montpelier			France	1,750,000.00
19	5720	Helms	D	52 Brattle Street	Cambridge	MA	02138		85,000.00
20	5855	Chin	F	Hotel Orient	Jurong			Singapore	150,000.00
21	6125	Hawes-Anderson	D	Waves Cottage	Palm Springs	FL	32382		600,000.00
22	6666	Mattheus	J	1050 12th Street	San Francisco	CA	94232		1,250,000.00
23	6954	Mayor	K	48 Winding Way	Salt Lake City	UT	84108		100,000.00
24	7008	Simms	R	Box 13, RFD 2	Topeka	KS	66104		1,500,000.00
25	7558	Yee	L	2938 42nd Street	New York	NY	10032		1,500,000.00
26	7640	Raymond	S	398 Centre Street	Winnipeg	OM		Canada	500,000.00
27	7700	Connors	S	27 Portfolio Drive	Belair	CA	90026		900,000.00
28	8585	Sampson	L	29 Buena Vista Drive	Tiburon	CA	97992		150,000.00
29	8776	Weidner	R	56 Santa Ysbel	San Francisco	CA	94332		120,000.00
30	8996	Smith	J	Hotel Americain	Paris			France	1,000,000.00
31	9004	Ranier	T	8947 San Andreas	Klamath Falls	OR	97603		125,000.00
32	9226	Simpson	H	3 Pooks Hill	Dallas	TX	75211		75,000.00
33	9658	O'Hare	C	1 Airport Drive	Chicago	IL	60542		2,500,000.00

In *customer*, the cursor is on *Hanover's* record, who placed the first order for a robot-valet in *orders*. All the selected records appear in the *answer* table when you use **View** to display it.

Groups of Records

All the queries we've discussed so far have asked questions about individual records in a table. But you can also ask questions about **groups of records** taken together. You can

- select records based on characteristics of a group (such as which states have two or more customers)
- calculate statistics on groups of records (such as the average credit limit of customers in each state)
- compare characteristics of a group with other records (such as which customers have more credit than any California customer).

These questions are distinctive because you have to consider more than one record at a time to answer them. For example, no individual record in *customer* will tell you which states have more than one customer, or what their average credit limit is. You have to look at a group of records together.

You can use the **summary operators** in Table 4-2 to answer these and other questions about groups of records.

The *Field Type* column indicates the types of fields in which you can use each summary operator. Not all summary operators work with all field types. For example, only *count*, *max*, and *min* work with alphanumeric fields.

The *Default Grouping* column shows whether the calculation normally includes all values in the group or only unique values. By default:

- *sum* and *average* work on all the values in a field, adding or averaging the values whether or not there are duplicates
- *count*, *max*, and *min* work only on unique values, ignoring any duplicates in the field.

You can override these default groupings by adding the word *all* or *unique* to the calc statement in a query. For illustrations see Examples 4-48 and 4-57.

Table 4-2. Summary Operators

Operator	Result	Field Types	Default Grouping
average	average of the values	all but A	all
count	number of values	all	unique
max	highest value	all	unique
min	lowest value	all	unique
sum	total of the values	all but A and D	all

Selecting Records Based on Groups

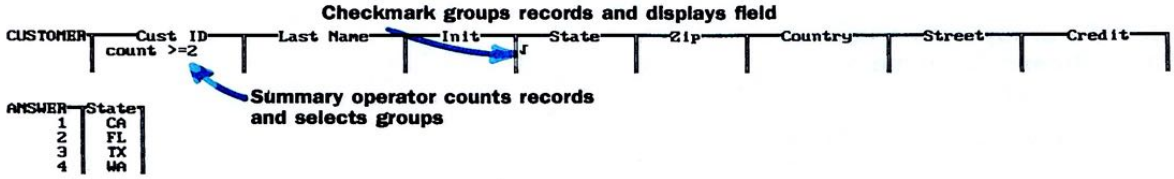
You can use the summary operators in Table 4-2 in queries to specify selection conditions for groups of data. For example, perhaps you want to find the states in which the customers' average credit limit is less than $75,000. Or you might want to know which customers have placed more than 12 orders in the past year. Summary operators are a powerful way to compile such information quickly.

Checkmarks on the same line as a summary operator serve a dual purpose:

- to divide the records into groups based on the values in the checked field
- to include that field in the *answer* table.

4-46. Selecting Records Based on a Group Count

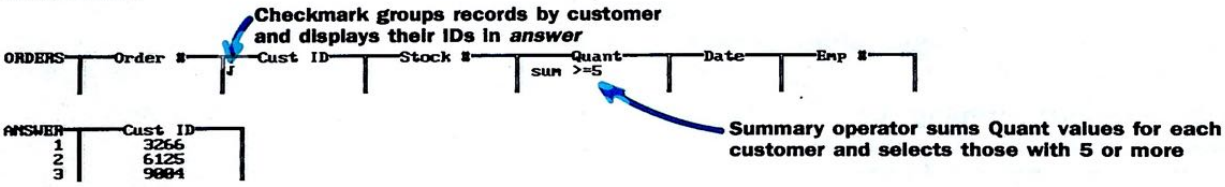
Suppose you want to know the states in which two or more customers are living.



Checking the State field indicates that you want to group by State and display the states that are selected. Typing **count> = 2** in Cust ID tells Paradox to count all the different Cust ID values for each group, and to select groups for which the count is 2 or more.

4-47. Selecting Records Based on a Group Sum

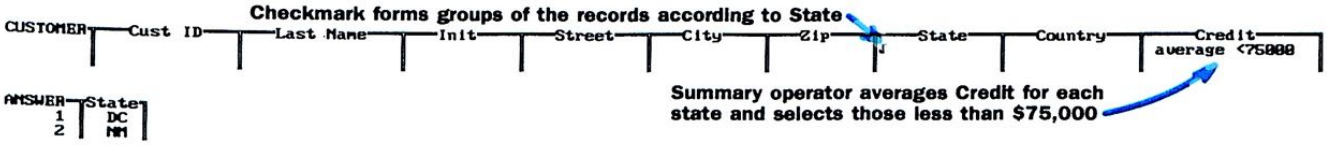
Suppose you want to know which customers have ordered a total of five or more items.



If you want to see the customer names, you can use example elements to link *orders* to *customer*. See Example 4-50 for an illustration.

4-48. Selecting Records Based on a Group Average

Suppose you want to know the states in which the average credit limit is less than $75,000.

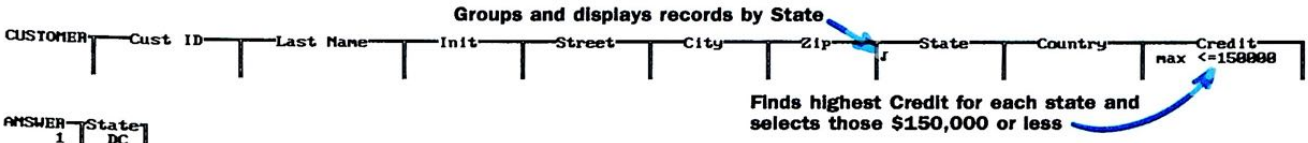


ANSWER	State
1	DC
2	NM

If you wanted to exclude duplicate credit values from the average—not the usual practice—you could type **average unique <75000** in the Credit field.

4-49. Selecting Records Based on a Group Maximum

Suppose you want to know the states in which the highest credit limit is no more than $150,000.



ANSWER	State
1	DC
2	MA
3	NM
4	OR
5	UT

You can also use example elements to form groups with (and display) a field in a different table as the summary operator. This is illustrated in Example 4-50.

4-50. Selecting Records Based on a Group Minimum

Suppose you want to know which products were first ordered after March 1, 1988. The order dates are in *orders*, while the product names are in *products*. You can link the two tables by their common Stock # field.

Finds earliest order for each product and selects those after March 1, 1988

```
ORDERS┬──Order #──┬──Cust ID──┬──Stock #──┬──Quant──┬──Date──┬──Emp #──┐
      │           │           │ item      │         │ min >3/1/88 │         │
```

```
PRODUCTS┬──Stock #──┬──Description──┬──Quant──┬──Price──┐
        │ item      │ ✓             │         │         │
```

Groups and displays records by product name

```
ANSWER┬──Description──┐
    1 │ Diamond-filled bathtub │
    2 │ Matching panthers/leashes │
    3 │ Mink handkerchiefs (13) │
    4 │ Portable suntan machine │
```

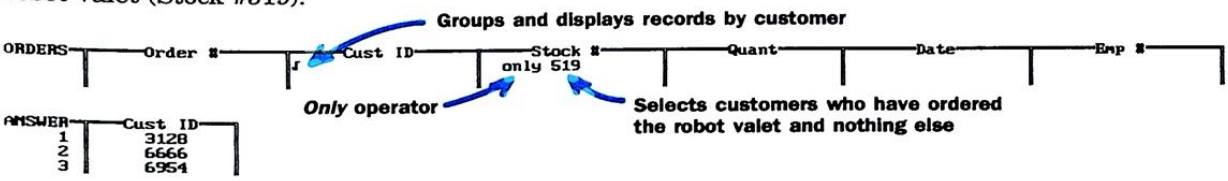
You might also want to know what the actual date of the earliest order is. Because checking the Date field would confuse Paradox by using order date to form groups, you'll need to use the *min* operator with *calc* to display this. See Example 4-55 later in this section.

The Only Operator

The **only** operator is not a summary operator, since it can't be used to perform calculations. However, it works in much the same way to select groups whose records all contain the same value and no others. For example, if you want to find out which customers have ordered only the portable suntan machine, (as opposed to those who have ordered that machine as well as other products), you can use the *only* operator in your a selection condition.

4-51. Selecting Sets Containing Only One Value

Suppose you want to know which customers have ordered only the robot-valet (Stock #519).



The checkmark in Cust ID tells Paradox that you want to group by customer and display the IDs that are selected. Typing **only 519** indicates that you want Paradox to look at the set of items ordered by each customer, and to select those that include *only* the robot-valet.

If you typed **519** without the *only* operator, Paradox would show you all the customers who have ordered the robot-valet, including those who have also ordered other items.

Calculations on Groups of Records

In addition to calculating new fields for each record, you can also calculate statistics like total and average for groups of records. For example, you might want to know

- how many of each product have been ordered
- the total amount of sales to each customer
- how many customers live in each state
- the average salary of employees in each job classification in your department
- the highest and lowest customer credit limits.

You can use the summary operators, shown in Table 4-2 earlier in this chapter, with the *calc* operator to count, sum, average, and find the minimum or maximum values in the fields of your tables. To do this, type **calc** and the appropriate summary operator in the field you want calculated. For example, if you want to calculate the sum of the number of orders placed, you would type **calc sum** in the Quant field of the *orders* query form.

4-52. Calculations on Groups

Suppose you want to know the total number of each product that has been sold. This information is contained in the *orders* table. You can use the *calc sum* operator to make this calculation.

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
			✓	calc sum		

Checkmark forms groups

Calc sum operator

ANSWER	Stock #	Sum of Quant
1	130	1
2	235	1
3	244	5
4	422	1
5	519	9
6	558	15
7	632	8
8	890	1
9	983	1

Sum for each group

Groups based on Stock #

The check in the Stock # field tells Paradox that the orders for each Stock # should be grouped together.

The *calc sum* in the Quant field tells Paradox to calculate the sum of the values in this field. Note that Paradox calls the new field in the *answer* table *Sum of Quant*. You could use the *as* operator to rename the field.

4-53. Groups Based on More than One Field

Now suppose you want to know the total number of each product that has been sold by each salesperson. The *calc sum* operator is the same as in Example 4-57, but this time both the Stock # and Emp # fields have been checked, and the computed field is renamed.

Calc sum operator

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
			✓	calc sum as Seller's Total		✓

Checks form groups

Groups based on Stock # and Emp #

ANSWER	Stock #	Emp #	Seller's Total
1	130	775	1
2	235	517	1
3	244	146	8
4	244	422	5
5	422	422	1
6	519	146	3
7	519	422	1
8	519	517	3
9	519	775	2
10	558	146	15
11	632	146	9
12	632	775	1
13	890	517	1
14	983	517	1

Renamed field

Sum for each group

Number of Stock #519 sold by each salesperson

The checks in Stock # and Emp # tell Paradox to group orders based on both of these fields. The *as* operator clarifies the calculated field's contents.

Forming Groups

As usual, when you use *calc,* a new field containing the calculation is added to the *answer* table. A value is computed for each record in *answer*.

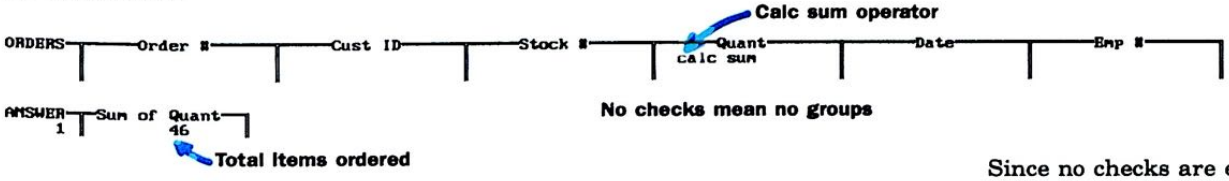
But when you use *calc* with a summary operator, you are performing calculations on groups of records. Thus, when you press Checkmark [F6] to display fields, you are actually forming groups on which to perform the calculation. If you enter no checkmarks, the calculation will be performed on all the records in the table in one group. If you place a checkmark in the same field as the summary operator, you may not get the result you want.

Similarly, when you enter conditions to select records, you are selecting groups for inclusion in the *answer* table.

The last column of Table 4-2 shows the *default grouping* for the summary operators—whether they work on all the values in the field, or just the unique ones (ignoring duplicates). You can override the defaults by adding the word *all* or *unique* to the summary operator, as shown in Example 4-57.

4-54. Whole-Group Calculations

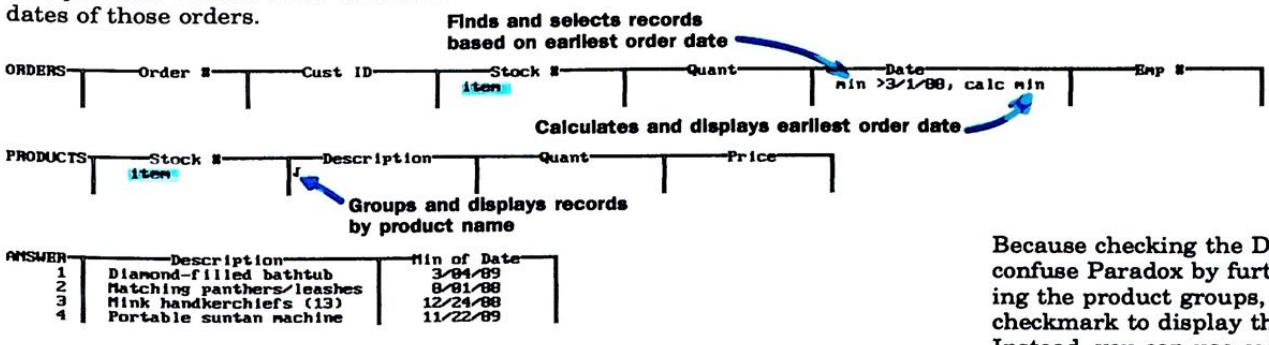
Suppose you want to know the total number of products sold, regardless of what they are or who ordered them. The use of *calc sum* is the same as in Examples 4-52 and 4-53, but this time no checks have been entered so that the calculation is performed on one group of all the records.



Since no checks are entered on the query form, no groups are formed. The sum of quantity ordered is calculated for all the records in the *orders* table.

4-55. Selecting and Displaying Summary Values

Suppose you want to know which products were first ordered after March 1, 1988, as in Example 4-50, but in this case you also want to know the actual dates of those orders.



Because checking the Date field would confuse Paradox by further subdividing the product groups, you can't use a checkmark to display the order date. Instead, you can use *calc min* to display the date while preserving the correct grouping for the query.

4-56. Counting Unique Values

Suppose you want to know the number of customers who have placed orders. To calculate this, you can use the *calc count* operator in the Cust ID field of the *orders* query form.

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
		calc count				

***Calc count* operator**

ANSWER	Count of Cust ID
1	13

Duplicates ignored

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
1	1100	3120	519	2	5/31/86	775
2	1442	9004	519	2	10/27/86	146
3	1574	2177	632	1	11/22/89	775
4	2200	4277	130	1	2/20/87	775
5	3351	3266	519	1	12/16/90	422
6	3005	9004	244	5	9/04/89	422
7	4492	5341	244	3	12/24/88	146
8	5119	7000	235	1	3/04/89	517
9	6235	2779	890	1	8/01/88	517
10	6975	6666	519	3	6/24/89	517
11	7643	6954	519	1	4/30/88	146
12	8070	6125	632	8	6/04/90	146
13	8933	9226	422	1	4/20/87	422
14	9226	1704	903	1	1/14/88	517
15	9554	3266	558	15	7/27/87	146

2 orders for customer #9004

2 orders for customer #3266

The *answer* shows a count of 13 customers. What does this represent? If you look at the *orders* table, it contains not 13 but 15 values in the Cust ID field. However, since two customers have made multiple purchases, some of the values are duplicates. The count tells you that 13 different customers have ordered your products. This is what Table 4-2 means when it says that *count*, by default, works on unique values.

Notice that, since no checks are entered on the query form, no groups are formed. The count of customers is calculated for all the records in the *orders* table.

4-57. Counting All Values

Now suppose you want to know the total number of orders placed by customers (regardless of multiple orders). This time use the *calc count all* operator because you want duplicate Cust IDs to be counted.

***Calc count all* operator**

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
		calc count all				

ANSWER	Count of Cust ID
1	15

Duplicates counted

This *answer* shows a count of 15 customers, indicating that the duplicate values have been included.

Working with Sets of Records

A **set** is a kind of group—a specific group of records about which you intend to ask further questions. For example, you can use Paradox's **set keyword** to define the set of all the books in the Investment series, or all the customers from California.

Once you've defined a set in a query, you can compare it to other records or to groups of records. There are two kinds of comparisons you can make:

- You can compare other groups of records to the set. For example, you can ask:
  - Which customers have bought **only** books in the Investment series?
  - Which customers have bought **all** the books in the Investment series?
  - Which customers **haven't bought any** products that sell for more than $100,000?
  - Which products have been ordered **only** by customers from the West?
  - Which students have taken **all** the required courses for a chemistry major?
  - Which students have taken **no** science courses?

  These **set comparisons** use a special group of query operators including **only**, **no**, **every**, and **exactly**.
- Since a set is a kind of group, you can also use summary operators to compute the **sum**, **count**, **average**, **min**, and **max** of its values. Then you can compare the result to the values in other records. For example:
  - Which customers' credit limits are **more than twice the average** credit limit?
  - Who has ordered any product that costs at **least 25% more than the average** price of all products?
  - Have customers **from any other state ordered more** books than customers from Texas?
  - Which employees **make less than the highest-paid** sales representative?

  See Table 4-2 earlier in this chapter for a full listing of summary operators.

Set operations are particularly useful for revealing trends and patterns in raw data, which would otherwise take a series of steps to uncover. Paradox's ability to answer these kinds of questions in a single query is very powerful.

Set Queries

As example 4-58 illustrates, every set query has these components:

- one or more lines that define a set
- one or more lines that display other records that meet certain comparisons to the set
- (optional) one or more linked lines that display related information.

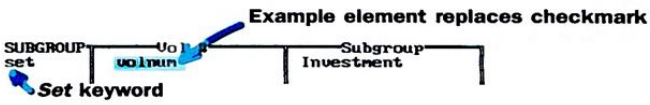
When you construct or look at a set query, try to see it in terms of the basic components outlined here: the set definition, the set comparison, and any additional links. You'll find set queries clearer and more useful if you keep this structure in mind.

4-58. Constructing a Set Query

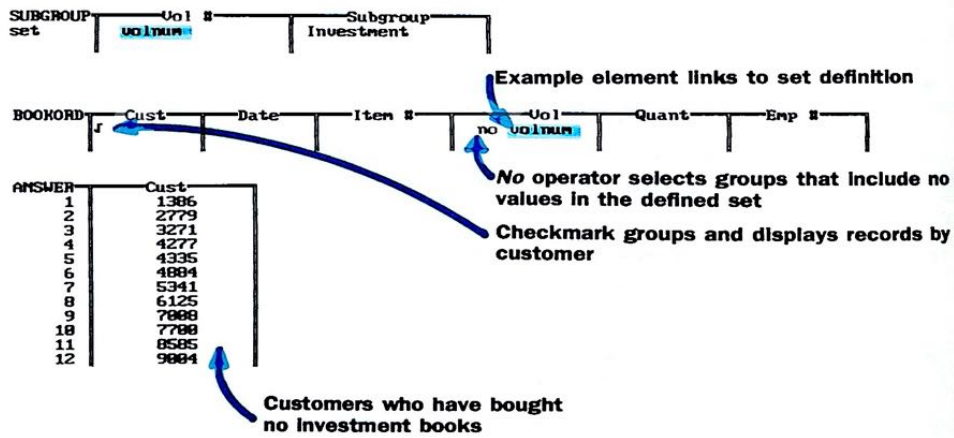
Suppose you want to know which customers have not yet purchased volumes from the Investment series.

1. First define the set, which consists of the volumes in the Investment series. If you wanted to retrieve these volumes, you'd use this simple query:

To formulate the query as a set definition, type set in the leftmost column of each line in the query, and substitute an example element for the checkmark.



2. Now that the set is defined, you want to compare it to records in *bookord*. Since you want to group those records by customer, check the Cust field. Then enter the set comparison *no volnum* in the Vol field to select customers who have ordered **no** Investment books.



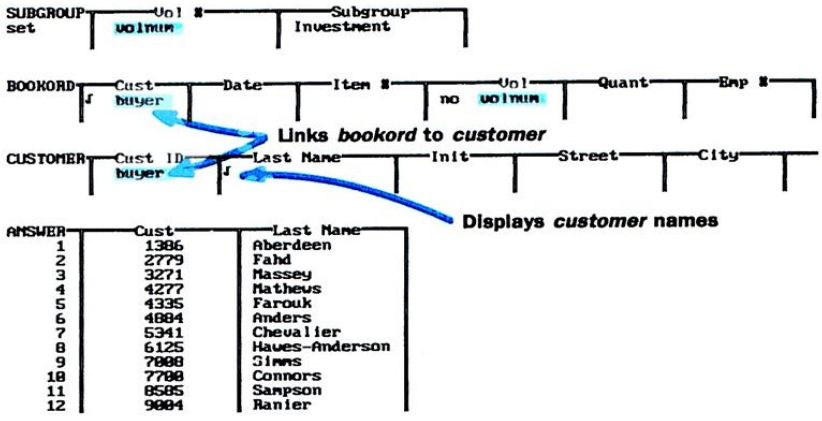
Example 4-58. Constructing a Set Query (continued)

3. If you want, check other fields or include extra links to display information not already in the query. In this case, add the example element *buyer* to retrieve the customer names.

When you add checkmarks, make sure to do so on other lines of the query, so they don't interfere with the set definition or the grouping of records.

This query displays the names of customers who haven't ordered any of the volumes in the Investment series. It's not the same as a query that uses the condition **not Investment** in *subgroup* instead of the *no* operator and the set keyword. (That query would retrieve customers who ordered books in other categories, whether or not they'd also ordered Investment books.)

Note that the checkmark in the *bookord* Cust field both groups the records by customer and displays customer numbers. If you want to omit the numbers, see "The Groupby Operator" later in this section for information on Groupby [Shift][F6].



Defining a Set

As Example 4-58 illustrates, defining a set of records in a query is very much like selecting them to be included in the *answer* table. Think of a set definition as a kind of "selection within a selection" or a "query within a query." On the query forms, enter selection conditions that define the records to be included in the set. If the information is in more than one table, use example elements to link the query forms.

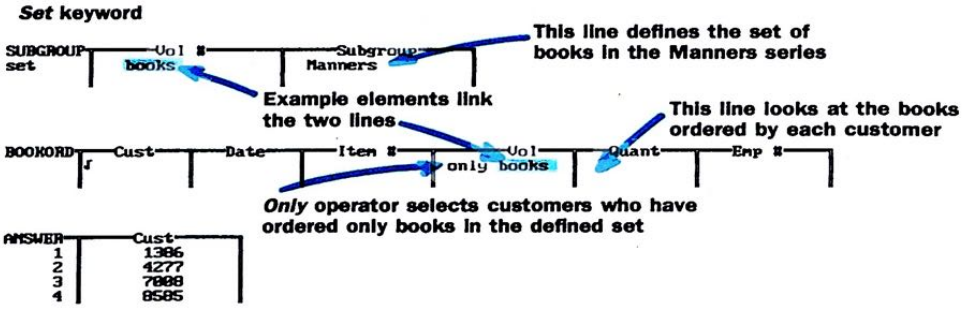
Then, do the two things that distinguish a set definition from selecting records:

- Type the *set* keyword in the leftmost field of all lines in the query that define the set.
- Where you would ordinarily place checkmarks to select fields, substitute example elements instead. Lines that are part of the set definition cannot contain checkmarks or *calc* operators.

When you go on to compose the query lines that compare and retrieve records, you'll use these same example elements to link the comparison lines to the set definition.

4-59. Defining a Set

Suppose you want to know which of your customers have purchased **only** books in the Manners series. Book purchases are shown in the sample *bookord* table, while the bookds in each series are listed in *subgroup*.



The *subgroup* query form, which includes the *set* keyword in the leftmost field, defines the set of books in the Manners series. The *bookord* query form tells Paradox to group the orders placed by each customer, and then select those who have ordered only books that are included in the defined set. The example element *books* is used to link the two tables.

Armed with this information, you could plan a special sales promotion to induce customers interested in etiquette to buy other titles. Customers who have ordered books from any other series are not listed in the *answer*.

As Example 4-60 shows, a set definition can occupy more than one line. However, the process of defining the set is exactly the same.

4-60. A Two-Line Set Definition

Suppose you want to know which books cost less than the average price of books in the Manners series.

```
VOLS      Vol #      Title      Book      Price
set       number                          mprice
                                          <average mprice

SUBGROUP  Vol #      Subgroup
set       number     Manners
```

This line selects books that cost less than the average of the set

These lines define the set of Manners books and their prices

ANSWER	Book	Price
1	Forks	29.95
2	Hunt	29.95
3	MOMA	29.95
4	Monac	29.95
5	Plumb	29.95
6	Sherr	29.95
7	Villa	29.95
8	Yacht	29.95

Notice that the set definition occupies two different lines in the query. Since you're interested in both the Manners books and their prices, you must include lines from both *subgroup* and *vols* in the set definition. The second line of the vols query selects books priced less than the average of the set.

If you now want to know who has ordered the books you selected, just use example elements to link *bookord* and customer into the query.

This line finds out who ordered the selected books

```
VOLS      Vol #      Title      Book      Price
set       number                          mprice
          bookid                          <average mprice

SUBGROUP  Vol #      Subgroup
set       number     Manners

BOOKORD   Cust       Date       Item #     Vol       Quant     Emp #
          custid     bookid

CUSTOMER  Cust ID    Last Name  Init      Street    State     Zip       Country   Credit
          custid
```

This line displays the customer names

Answer	Book	Price	Last Name
1	Forks	29.95	Aberdeen
2	Forks	29.95	Bonnefemme
3	Forks	29.95	Hawes-Anderson
4	Forks	29.95	Helms
5	Forks	29.95	McDougal
6	Forks	29.95	Weidner
7	Hunt	29.95	Bonnefemme
8	Hunt	29.95	Fischer
9	Hunt	29.95	Hanover
10	Hunt	29.95	Yee
11	MOMA	29.95	Fischer
12	MOMA	29.95	Leonardo
13	MOMA	29.95	Matthews
14	MOMA	29.95	O'Hare
15	MOMA	29.95	Weidner
16	MOMA	29.95	Yee
17	Monac	29.95	Anders
18	Monac	29.95	Bonnefemme
19	Monac	29.95	Chavez
20	Monac	29.95	Chevalier
21	Monac	29.95	Connors

Set Comparisons

Once you've defined a set, you can compare it to other records. One way of doing this is to compare groups of records to the set. In Examples 4-58 and 4-59, you saw how to find out who has ordered **only** books in the Manners series or **no** books in the Investment series. *Only* and *no* are two of the four **set comparison operators** you can use to make this sort of comparison.

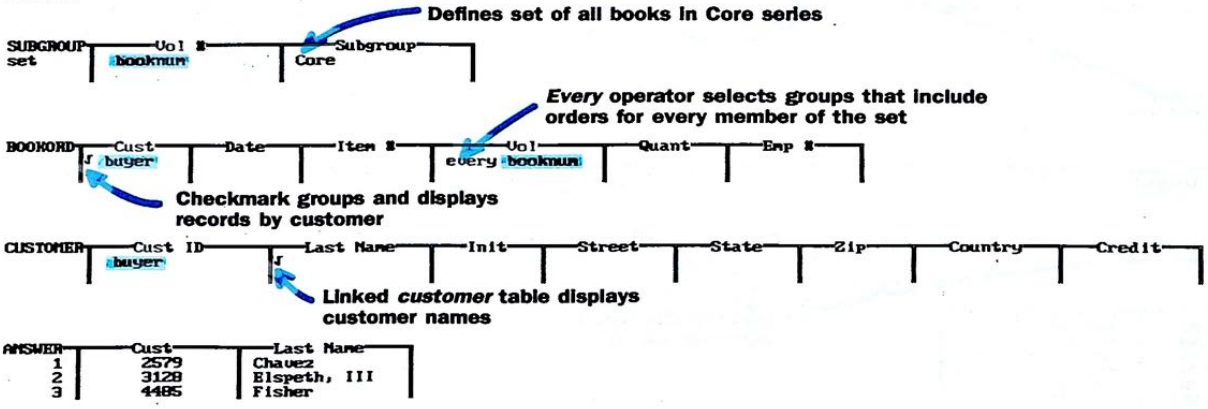
To form groups of records to compare to the defined set, you use checkmarks. The method is the same as when you use summary operators, as described earlier in this section.

Table 4-3. Set Comparison Operators

Operator	Nature of Comparison	Example
only	**The values in the group contain only members of the defined set**	**Which customers have ordered only one book in the Travel Series?**
no	**No values in the group are in the defined set**	**Which patients on Ward 12 have not exhibited any symptom seen in the patients on Ward 6?**
every	**The values in the group include all members of the defined set**	**Which students have taken all the courses required for a major in chemistry?**
exactly	**The values in the group exactly match the members of the defined set (combines only and every)**	**Which customers have ordered all the books in the Travel series and no others?**

4-61. Selecting Groups that Include Every Member of a Set

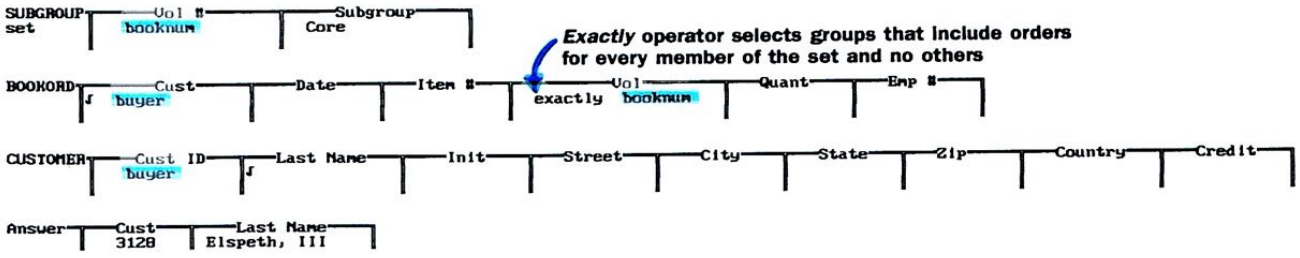
Suppose you want to know who has ordered all the volumes in the Core series.



The *set* keyword identifies the set of books in the Core series. The *every* operator tells Paradox to look at the books ordered by each customer, and selects those that include every volume in the defined set. Customers who have also ordered books from other series may also appear in the *answer*.

4-62. Selecting Groups that Exactly Match a Set

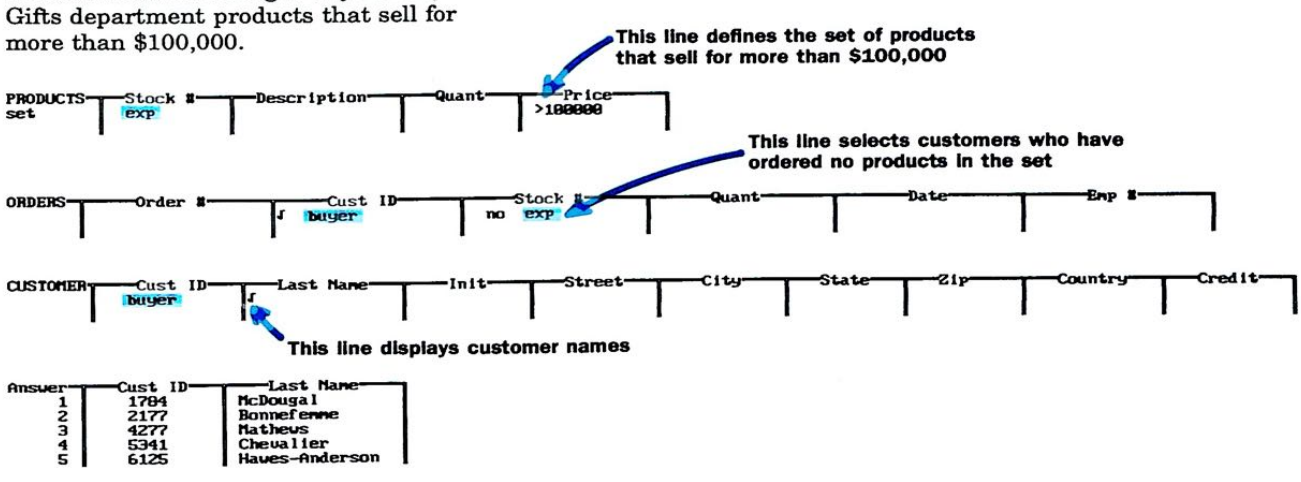
Suppose you want to find the customers who have ordered every volume in the Core series, but no books from any other series.



This query is identical to Example 4-63, except that the *every* operator is replaced by *exactly*. This query also selects customers who have ordered all the books in the Core series, but excludes those who have also ordered books in other series. *Exactly* has the effect of combining the *only* and *every* operators.

4-63. Selecting Groups that Include No Members of a Set

Suppose you want to find out which customers haven't bought any Luxury Gifts department products that sell for more than $100,000.



The Groupby Operator

Shift **F6** **Groupby**

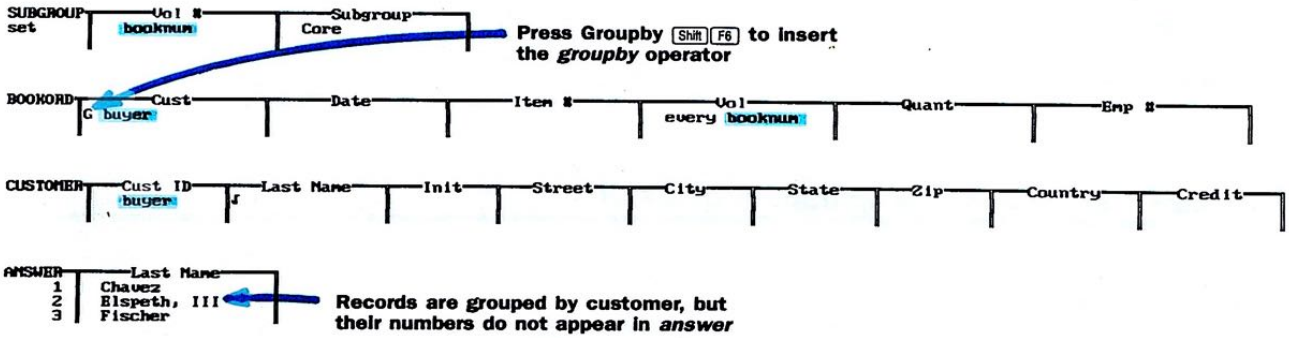
Checkmarks on the same line as a set comparison operator (like those on the same line as a summary operator) serve a dual purpose:

- to group the records by the values in the field
- to include the field in the answer table.

If you want to group by the field but **not** display its values in *answer*, press Groupby [Shift][F6] instead of Checkmark [F6]. You'll see a **G** indicator in that field instead of a checkmark. Note that the *Groupby* operator can be used only in cunjunction with set queries.

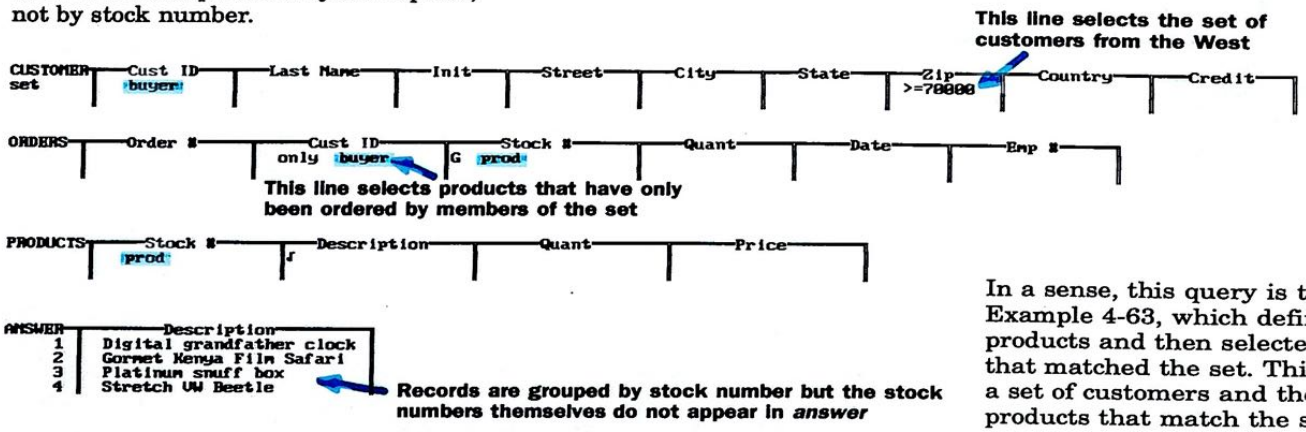
4-64. Using Groupby [Shift][F6]

Suppose you want to know who has ordered all the volumes in the Core series, as in Example 4-61, but you want to display only the customer names and not their numbers.



4-65. Grouping by Customer

Suppose you want to know which Luxury Gifts products have been purchased only by customers from the West (zip codes 70000 or greater). You want to list the products by description, not by stock number.



In a sense, this query is the reverse of Example 4-63, which defined a set of products and then selected customers that matched the set. This query defines a set of customers and then selects products that match the set.

Comparisons to a Summary Value

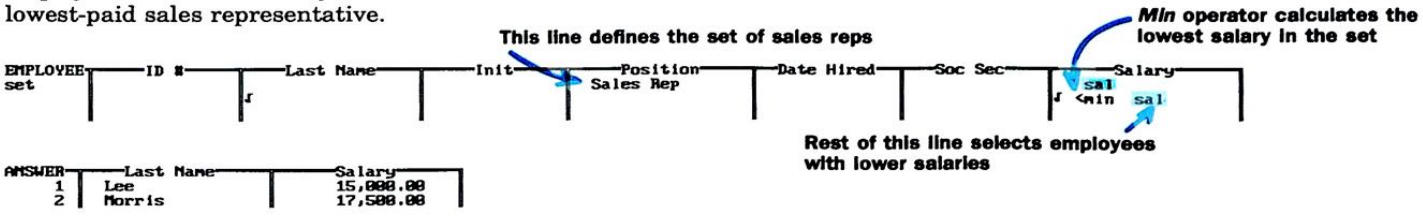
The preceding section explained how to compare groups of records to a defined set. You can also compare records to summary values derived from a set.

When you do this, you define the set in the usual way. In the line that selects the records to compare, however, you use a summary operator (see Table 4-3) instead of a set comparison operator. You can place the summary operator in an arithmetic expression if you want.

You can also use summary operators to compare groups of records to a summary value derived from the set.

4-66 Comparing Records to a Minimum

Suppose you want to know which employees make less money than the lowest-paid sales representative.



Kling, the lowest-paid sales representative, makes $18,000. This query selects all employees whose salaries are less.

4-67. Comparing Records to an Average

Suppose you want to find out which customers have ordered Luxury Gifts department products costing at least 25% more than the average price of all products.

```
ORDERS ┬──Order #──┬──Cust ID──┬──Stock #──┬──Quant──┬──Date──┬──Emp #──┐
       │           │ ↓         │ thing     │         │        │         │
```

Selects customers who have ordered these products

```
PRODUCTS ┬──Stock #──┬──Description──┬──Quant──┬──Price──┐
set      │ thing     │               │         │ amount  │
         │           │               │         │ >=(average amount) * 1.25 │
```

Defines set of all products

***Average* operator computes average price of products in the set**

Rest of this line identifies products that sell for more than 125% of the average

```
ANSWER ┬──Cust ID──┐
     1 │   2779    │
     2 │   7008    │
```

The *set* keyword on the first line of the *products* query form defines the set of all products and their prices. The second line multiplies their average by 1.25, compares the result to individual product records, and links selected products to the *orders* table.

Now suppose that, in addition to the customer numbers, you also want to know their names, what they bought and for how much, and what the average product price is.

```
ORDERS ┬──Order #──┬──Cust ID──┬──Stock #──┬──Quant──┬──Date──┬──Emp #──┐
       │           │ name      │ thing     │         │        │         │
```

Displays product names and prices

```
PRODUCTS ┬──Stock #──┬──Description──┬──Price──┬──Quant──┐
set      │ thing     │ ↓             │ amount  │         │
         │           │               │ ↓ calc average amount as Avg Price, >=(average amount) * 1.25 │
```

Calculates average product price

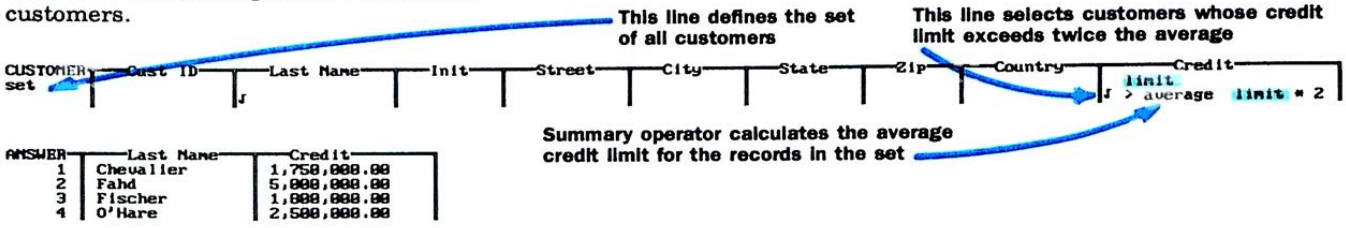
```
CUSTOMER ┬──Cust ID──┬──Last Name──┬──Init──┬──Street──┬──City──┬──State──┬──Zip──┬──Country──┬──Credit──┐
         │ name      │ ↓           │        │          │        │         │       │           │          │
```

Displays customer names

```
ANSWER ┬──Description──────────┬──Price──────┬──Last Name──┬──Avg Price──┐
     1 │ Diamond-filled bathtub │ 1,499,000.00 │ Simms       │ 272,747.50  │
     2 │ Matching panthers      │   385,000.00 │ Fahd        │ 272,747.50  │
```

4-68. Comparing Records to a Summary Value

Suppose you want to know which customers have credit limits greater than twice the average credit limit of all customers.

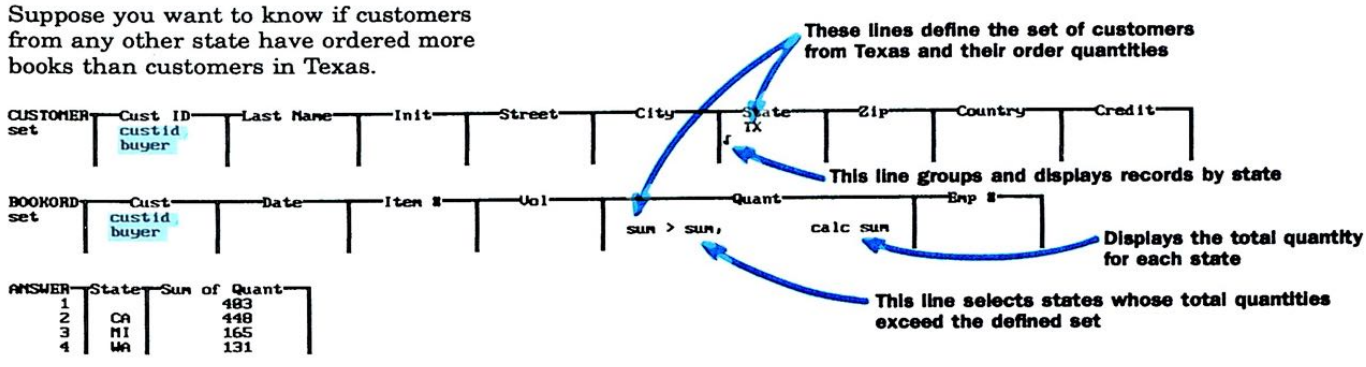


Even though all the information is in one table, you still need to separate the two parts of the query into two lines. The *set* keyword on the first line defines the set of all customers in the table. If you had wanted to, you could have restricted that set to customers from New York by typing **NY** in the State field.

The arithmetic expression on the second line includes the *average* summary operator. Paradox calculates the average on all the members of the defined set, and then uses it to select records for the *answer* table.

4-69. Comparing Two Summary Values

Suppose you want to know if customers from any other state have ordered more books than customers in Texas.



Think of this as two queries in one. The first line of each query form defines the set of Texas customers and the quantities of books they've ordered.

Now look at the second lines. Without the *sum* expression, they simply total the order quantities for each state. The *sum* expression selects only those states whose total order quantities exceed that of the defined set (Texas).

Advanced Query Operations

Now that you've seen the basic techniques you can use to ask questions about your data, you can combine many of the powerful tools of querying—example elements, calculations, master and lookup tables, set operations, and more—to get answers to sophisticated, subtle, and complex questions.

Inclusive Links

In "Linking to All the Records in a Table" earlier in this chapter, you saw how to use the **inclusion operator** (!) to include a complete set of records in the answer to a query. This is sometimes called an **outer join**. You add the ! operator to an example element in a query statement to retrieve all of the records in that table, whether or not they match records in another table. You can also add selection conditions to refine the set of master records which are included in the *answer*.

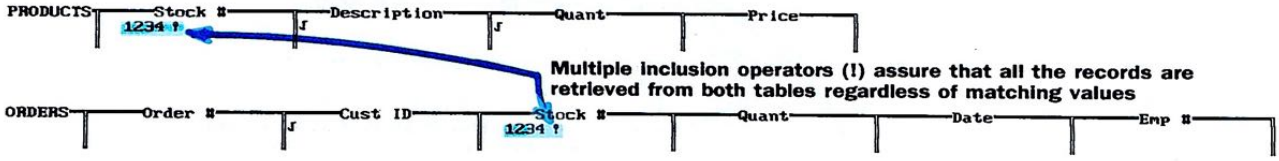
Examples 4-34, 4-35, and 4-36 used inclusive links in queries involving one "master" and one "lookup" table. This section shows you how to

- use multiple !s to retrieve all of the records from more than one table
- use !s in an arithmetic expression
- use both inclusive and exclusive links in the same query.

Finally, you'll find rules governing the uses of different kinds of links in the same query in the section "Rules for Linking Tables" later in this chapter.

4-70. Retrieving All the Records in Two Linked Tables

Suppose you want to know all of the orders customers have placed (whether or not the product is currently available), and all the products (whether or not customers have ordered them).



Answer **contains all products and all orders**

ANSWER	Cust ID	Description	Quant
1	1784	Laser pencil	
2		Gucci executive workstation	19
3	1784	Gourmet Kenya film safari	350
4	2177	Portable suntan machine	3
5	3128	Robot-valet	50
6	3266	Digital grandfather clock	266
7	3266	Robot-valet	50
8	4277	Stretch VW Beetle	3
9	5341	Mink handkerchiefs (13)	14
10	6125	Portable suntan machine	
11	6666	Robot-valet	50
12	6954	Robot-valet	50
13	7008	Diamond-filled bathtub	1
14	9004	Mink handkerchiefs (13)	14
15	9004	Robot-valet	50
16	9226	Platinum snuff box	88

Products that have not been ordered

Products that have been ordered but are no longer available

Note: The order for the laser pencil (item #234, which was discontinued and removed from *products* in Chapter 10 of the *Introduction to Paradox*) has been added to *orders* for this example only.

Using More than One Inclusive Link in a Query

A query using a single ! operator is sometimes called an **asymmetrical outer join** because an inclusive link is specified for only one of the tables involved in the query. A symmetrical outer join, then, is one in which you specify more than one inclusive link. Linking tables in this way can reveal information that might get lost in other queries.

The symmetrical outer join in this query is all-inclusive; it retrieves all the values in the common fields without requiring that they match each other.

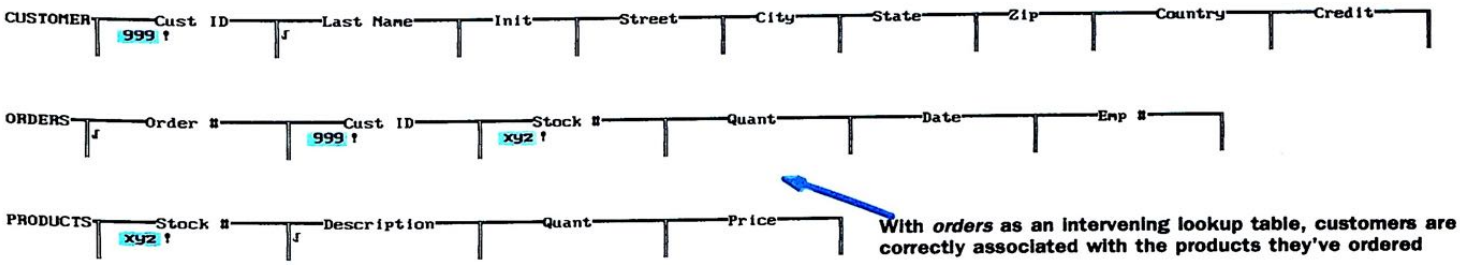
This *answer* table is more useful than simply viewing the *orders* and *products* tables separately because the information has been reorganized so you can immediately determine which products have not been ordered and which orders could not now be filled. In database theory, this kind of query is called a union. For more information on using both inclusive and exclusive links between common fields, see "Rules for Linking Tables" later in this section.

You can use inclusive links in two tables that don't share a common field, as shown in Example 4-71.

There are some restrictions on using multiple inclusive links in a query. For details, see "Rules for Linking Tables" later in this chapter.

4-71. Specifying Multiple Master-Lookup Table Links

Suppose you want a list of all customers and all products, showing who has ordered what.



With *orders* as an intervening lookup table, customers are correctly associated with the products they've ordered

ANSWER	Last Name	Order #	Description
1			Gucci executive workstation
2	Aberdeen		
3	Anders		
4	Bonneferme	1574	Portable suntan machine
5	Chavez		
6	Chevalier	4492	Mink handkerchiefs (13)
7	Chin		
8	Connors		
9	Elspeth, III	1180	Robot-valet
10	Fahd	6235	Matching panthers
11	Farouk		
12	Fischer		
13	Hanover	3351	Robot-valet
14	Hanover	9554	Digital grandfather clock
15	Harris		
16	Haves-Anderson	8070	Portable suntan machine
17	Helms		
18	Leonardo		
19	Massey		
20	Matthews	2280	Stretch VW Beetle
21	Matthews	6975	Robot-valet
22	Mayor	7643	Robot-valet
23	McDougal	9226	Gourmet Kenya film safari
24	Montaigne		
25	O'Hare		
26	Ranier	1442	Robot-valet
27	Ranier	3885	Mink handkerchiefs (13)
28	Raymond		
29	Sampson		
30	Samuelson		
31	Simms	5119	Diamond-filled bathtub
32	Simpson	8933	Platinum snuff box
33	Smith		
34	Svenvald		
35	Weidner		
36	Yee		

This product has not been ordered

These customers haven't ordered any products

With *customer* and *product* as master tables, all names and descriptions appear

Paradox assembles the complete sets of customers and products, and then matches them (where there are matches) through specific orders. This *answer* table can reveal successful and unsuccessful products as well as spending and non-spending customers.

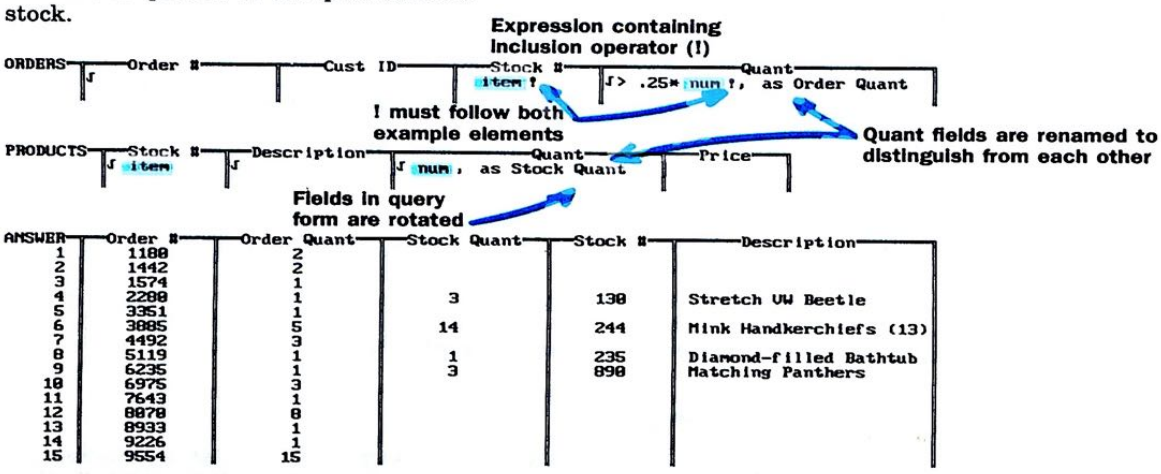
Using the Inclusion Operator in Expressions

You can also use inclusion operators (!) in expressions that perform calculations. This capability helps you construct compact, powerful queries.

For example, the Luxury Gifts department might be concerned about orders that it might not be able to fill from its current inventory. By using the ! operator with example elements in an expression, as shown in Example 4-72, you can see these exceptional orders in the context of all orders.

4-72. Using the Inclusion Operator in an Expression

Suppose you want a list of all orders, highlighting those for quantities that exceed one-quarter of the quantities in stock.



The ! operators in the *orders* query form ensure that the Order # and Order Quant fields contain all orders. Then, the Stock Quant, Stock #, and Description are retrieved from the *products* table **for orders that exceed one-quarter of inventory** (Quant = .25 * num). Since *products* contains no ! operator, its records are retrieved only for orders that meet the selection condition.

Notice that *orders* and *products* are actually linked by two example elements, item (used to connect orders to their products) and num (used in the selection condition to represent the quantity in stock). In the next section you'll see why the ! operator must follow both elements in *orders*.

Note: In this example, the *products* query form is rotated to make the two Quant fields adjacent in *answer*. For this to work, **Defaults/QuerySort/ImageOrder** must be selected in the Custom Configuration Program. For details, see "The *Answer* Table" near the beginning of this chapter.

Rules for Linking Tables

In some ways both asymmetric and symmetric outer joins are different from other types of Paradox queries. The differences have mainly to do with the order in which the elements of a query are processed, and with the ways you can link the different lines of a query.

1. For any two lines in a query statement, you can use either an inclusive (!) or exclusive link to associate them, but not both.
2. You can use both exclusive and inclusive links in the same query statement, as long as they don't both involve the same pairs of lines. When you have both types of link in one query, they are processed in order from least to most inclusive. See "Order of Processing Links" later in this section for details.
3. You can use ! with any given example element only once per line and twice per query.

Different Types of Links in a Query

Here's an explanation of the first rule for linking tables:

▶ **For any two lines in a query statement, you can associate them with one type of link only.**

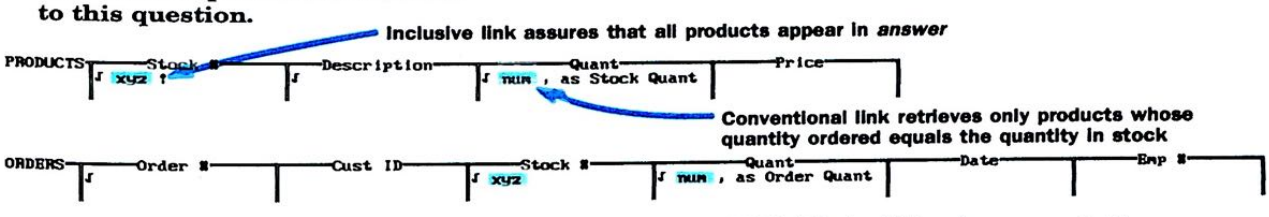
The reasoning behind this rule is simple. An inclusive link includes all the records from the master table, while an exclusive link includes only records whose values in the linked fields match each other. If you use both kinds, Paradox has no basis for deciding whether the exclusive or the inclusive link should be processed first, and the answer tables would be different depending on the sequence.

Example 4-73 shows a query that is invalid because it violates this rule. Example 4-74 shows how to answer the same question with a valid query.

4-73. An Invalid Query with Two Kinds of Links

Suppose you want to know which products, out of all current products, have orders for the same number of items as there are in inventory.

▶ **Note: This is an invalid query and will not produce the answer to this question.**



Which link should Paradox process first?

You might be tempted to combine these two link types to answer the question, but which link should Paradox process first? One link excludes what the other includes, and vice versa. For this reason, Paradox will not accept a query like this.

4-74. A Valid Solution to the Invalid Query

Suppose you wanted to know which products, out of all current products, have orders for the same number of items as there are in inventory.

PRODUCTS	Stock #	Quant	Description	Price
	✓ xyz !	✓ num !, as Stock Quant	✓	

Two inclusive links insure that all products will appear in *answer*

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
	✓		xyz	✓ num, as Order Quant		

Selection criterion restricts orders to those whose quantities equal inventory

ANSWER	Stock #	Stock Quant	Description	Order #	Order Quant
1	130	3	Stretch VW Beetle		
2	209	19	Gucci exec workstation		
3	235	1	Diamond-filled bathtub	5119	1
4	244	13	Mink handkerchiefs (13)		
5	422	88	Platinum snuff box		
6	519	50	Robot-valet		
7	550	266	Digital grandfather clock		
8	632	350	Portable suntan machine		
9	890	3	Matching panthers/leashes		
10	903		Gourmet Kenya film safari		

Since the links are both inclusive, they do not conflict and Paradox can apply the selection criterion to the orders after all the products are retrieved.

Order of Processing Links

As the previous section explains, you can't associate the same two lines of a query statement with both exclusive and inclusive links. You can use both types of links in the same query, however, as long as they are not applied to the same two lines. This combination can provide useful information, as Example 4-75 suggests.

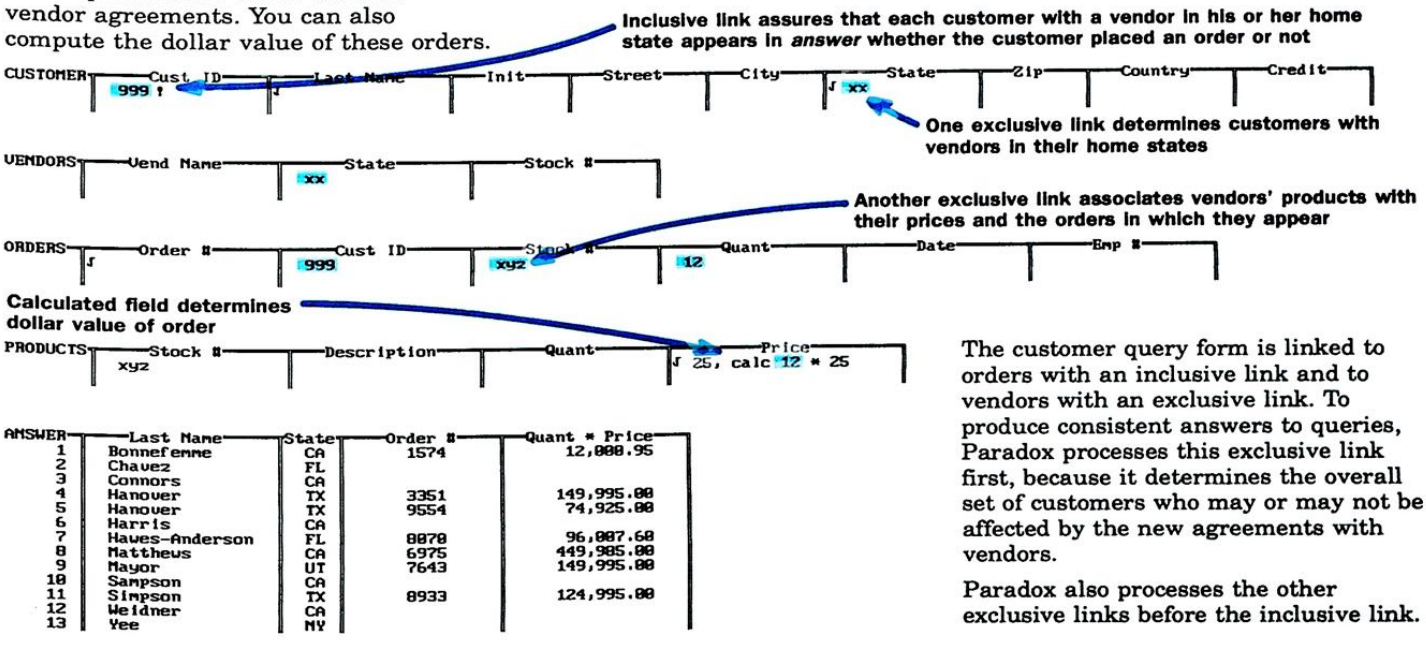
4-75. Multiple Types of Links to Answer a Question

Suppose that, in addition to the Paradox sample tables, you also have a vendors table containing information about the vendors who supply the products you sell. Vendors might look like this:

VENDORS	Vend Name	State	Stock #
1	Exotic Pets	UT	898
2	Looking Good Accessories	CA	632
3	At Your Service	TX	519
4	Avash With Gems	NY	235
5	Furs To Go	TX	244
6	Avash With Gems	FL	422
7	Looking Good Accessories	CA	558
8	Execu-Travel	NY	983

Now suppose also that the Luxury Gifts Department has recently concluded agreements with all its vendors not to sell items to customers in the same state as the vendor. Presumably the vendors no longer care to compete in their home states with the Luxury Gifts Department. In this situation, you would probably want to determine how current orders would be affected by these new agreements. This could help you predict the impact on future business.

You can use two types of links to find out which current orders placed by customers, among all customers, would not be permissible under the new vendor agreements. You can also compute the dollar value of these orders.



ANSWER	Last Name	State	Order #	Quant * Price
1	Bonnefemme	CA	1574	12,888.95
2	Chavez	FL		
3	Connors	CA		
4	Hanover	TX	3351	149,995.00
5	Hanover	TX	9554	74,925.00
6	Harris	CA		
7	Hawes-Anderson	FL	8870	96,887.60
8	Matthews	CA	6975	449,985.00
9	Mayor	UT	7643	149,995.00
10	Sampson	CA		
11	Simpson	TX	8933	124,995.00
12	Weidner	CA		
13	Yee	NY		

The customer query form is linked to orders with an inclusive link and to vendors with an exclusive link. To produce consistent answers to queries, Paradox processes this exclusive link first, because it determines the overall set of customers who may or may not be affected by the new agreements with vendors.

Paradox also processes the other exclusive links before the inclusive link.

As Example 4-75 shows, when a query includes several different kinds of links, Paradox processes the most exclusive links first:

1. Exclusive links, which don't retrieve records that aren't matched by records in another table, are processed first.
2. Asymmetrical inclusive links (with both master and lookup tables), which retrieve all the records from the master table but only the matched records from the lookup tables, are processed next.
3. Symmetrical inclusive links (with only master tables), which include all records from both tables, are processed last.

By processing exclusive links before inclusive links, Paradox guarantees consistent results to its queries. If you want Paradox to process the links in some other order, you must break your question into separate queries.

Chaining Queries Together

This chapter has presented all of the major operations that are available using query by example in Paradox. Once you understand these basic operations, you can answer just about any question you may have about your data.

Sometimes, however, you may not be able to answer a particular question by performing a single query. You may need to chain several queries together to get the final result you are looking for. In fact, you can sometimes arrive at the answer you want more quickly by performing several simple queries than by formulating a single "elegant" query.

Querying on a Network

When you place a query form for a table on the workspace, Paradox automatically places a prevent full lock on that table. If another user is already performing an operation that has placed a full lock on the table (such as emptying or restructuring it), you cannot start your query until the operation is finished and the lock is released.

For all except insert, delete, and changeto queries, when you press Do-It! [F2] to perform the query, Paradox takes a "snapshot" of the values in the tables involved. (To speed processing, this snapshot is not taken if no one else is using the tables.) Thus, you can perform queries while other users are viewing or even modifying the records in a table.

If another user happens to modify a table involved in the query during the brief time the snapshot is being taken, Paradox keeps trying to take the snapshot until it is successful. You'll see a message each time Paradox tries to perform the query. If you want to cancel the automatic retries, press [Ctrl][Break].

Insert, Delete, and Changeto Queries

When you press Do-It! [F2] to perform an insert, delete, or changeto query, Paradox places a full lock on all of the tables involved in the query. This lock is necessary because these types of queries change the values in the tables. If another user is working with any of the tables included in the query, you will not be able to process the query until all other users have released their locks on the tables.

Report

View Ask **Report** Create Modify Image Forms Tools Scripts Help Exit

Output, design, or change a report specification.

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Reports on a Network 119
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Report is used to arrange the information in a Paradox table into a printed report. Paradox's powerful, flexible **report generator** lets you format and present your data in almost any way you can imagine.

Alt **F7** **Instant Report**

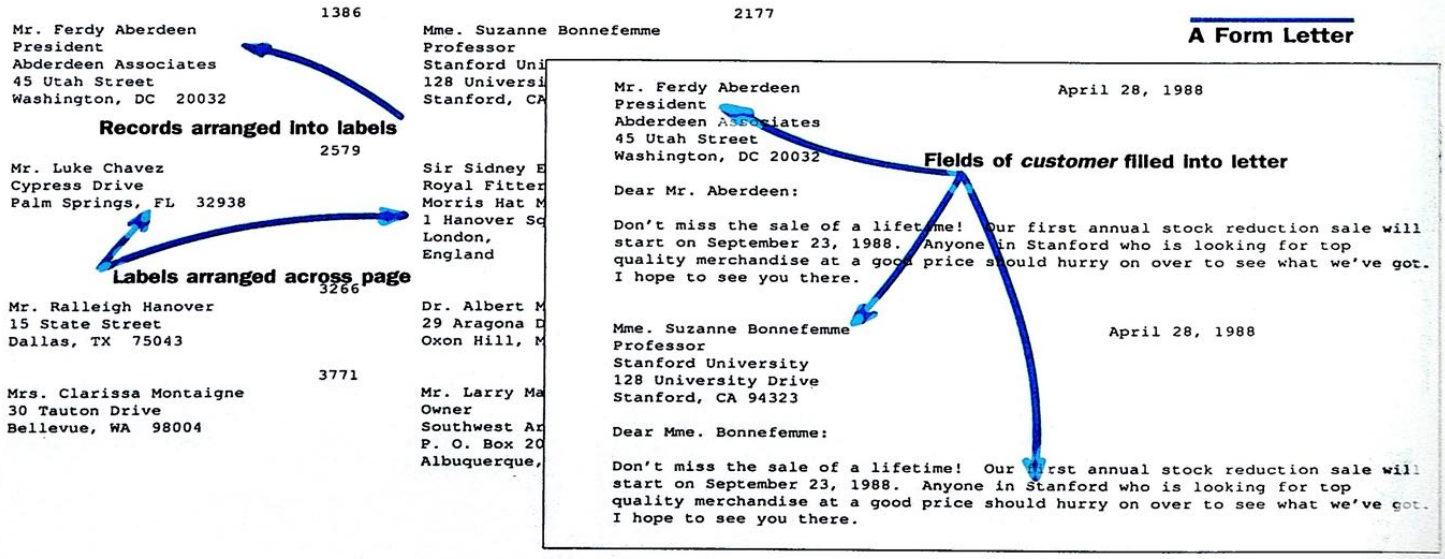
The simplest way to produce a report is to turn on your printer and press Instant Report [Alt][F7] while a table is on the screen. Paradox will automatically design and print a standard tabular report containing all the data in the table. In many cases, the standard report will be all you need.

But sometimes the standard format may not meet your needs. In that case, you can use the report generator to:

- select fields from the table
- select fields from other linked **lookup** tables
- change the names and formats of columns
- add titles
- wrap long fields onto several lines
- calculate new fields
- calculate totals and subtotals
- rearrange information on the page
- format mailing labels, including label stock with several labels arranged across a page.

The report generator is so versatile that it can even produce form letters!

Mailing Labels



4/28/88 Standard report Page 1

Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
1386	Aberdeen	F	45 Utah Street	Washington	DC	20032		50,000.00
1388	Svenvald	I	Government House	Reykjavik			Iceland	1,250,000.00
1784	McDougal	L	4950 Pullman Ave NE	Seattle	WA	98105		150,000.00
2177	Bonnefemme	S	128 University Drive	Stanford	CA	94323		75,000.00
2579	Chavez	L		Palm Springs	FL	32938		250,000.00
2779	Fahd	S		Riyadh			Saudi Arabia	5,000,000.00
3128	Elspeth, III	R	1 Hanover Square	London			England	1,000,000.00
3266	Hanover	A	15 State Street	Dallas	TX	75043		750,000.00
3271	Massey	C	29 Aragona Drive	Oxon Hill	MD	29902		1,000,000.00
3771	Montaigne	L	30 Tauton Drive	Bellevue	WA	98004		450,000.00
4277	Matthews	R	P. O. Box 20336	Albuquerque	NM	87234		50,000.00
		K	Hotel Cairo	Cairo			Egypt	250,000.00
		F	Bull Run Ranch	Aurora	CO	89022		600,000.00
		R	14 Willow Lane	Birmingham	MI	48011		1,800,000.00
4589	Leonardo	D	198 Via Canales	Rome			Italy	1,500,000.00
4700	Harris	J	Old Country Road	Atherton	CA	94322		750,000.00
4884	Anders	B	Jaktstigen 42	Lidingo			Sweden	300,000.00
5341	Chevalier	R	392 Boulevard Raspil	Montpelier			France	1,750,000.00
5720	Helms	D	52 Brattle Street	Cambridge	MA	02138		85,000.00
5855	Chin	F	Hotel Orient	Jurong			Singapore	150,000.00
6125	Hawes-Anderson	D	Waves Cottage	Palm Springs	FL	32382		600,000.00
6666	Matthews	J	1050 12th Street	San Francisco	CA	94232		1,250,000.00
6954	Mayor	K	48 Winding Way	Salt Lake City	UT	84108		100,000.00
7008	Simms	R	Box 13, RFD 2	Topeka	KS	66104		1,500,000.00
7558	Yee	L	2938 42nd Street	New York	NY	10032		1,500,000.00
7640	Raymond	S	398 Centre Street	Winnipeg	ON		Canada	500,000.00
7700	Connors	S	27 Portfolio Drive	Belair	CA	90026		900,000.00
8585	Sampson	L	29 Buena Vista Drive	Tiburon	CA	97992		150,000.00
8776	Weidner	R						
8996	Smith	J						
9004	Ranier	T						
9226	Simpson	H						
9650	O'Hare	C						

An Instant Report

Fields of *customer*

Records of *customer*

4/28/88 Credit Exposure by Country Page 1

Country	Cust ID	Last Name	Street	City	Credit
	1386	Aberdeen	45 Utah Street	Washington	50,000.00
	1784	McDougal	4950 Pullman Ave NE	Seattle	150,000.00
	2177	Bonnefemme	128 University Drive	Stanford	75,000.00
	2579	Chavez	Cypress Drive	Palm Springs	250,000.00
	3266	Hanover	15 State Street	Dallas	750,000.00
	3271	Massey	29 Aragona Drive	Oxon Hill	1,000,000.00
	3771	Montaigne	30 Tauton Drive	Bellevue	450,000.00
	4277	Matthews	P. O. Box 20336	Albuquerque	50,000.00
	4480	Samuelson	Bull Run Ranch	Aurora	600,000.00
	4485	Fischer	14 Willow Lane	Birmingham	1,800,000.00
	4700	Harris	Old Country Road	Atherton	750,000.00
	5720	Helms	52 Brattle Street	Cambridge	85,000.00
	6125	Hawes-Anderson	Waves Cottage	Palm Springs	600,000.00
	6666	Matthews	1050 12th Street	San Francisco	1,250,000.00
	6954	Mayor	48 Winding Way	Salt Lake City	100,000.00
	7008	Simms	Box 13, RFD 2	Topeka	1,500,000.00
	7558	Yee	2938 42nd Street	New York	1,500,000.00
	7700	Connors	27 Portfolio Drive	Belair	900,000.00
			29 Buena Vista Drive	Tiburon	150,000.00
	8776	Weidner	56 Santa Ysbel	San Francisco	120,000.00
	9004	Ranier	8947 San Andreas	Klamath Falls	125,000.00
	9226	Simpson	3 Pooks Hill	Dallas	75,000.00
	9650	O'Hare	1 Airport Drive	Chicago	2,500,000.00
		Total credit outstanding for :			14,830,000.00
Canada	7640	Raymond	398 Centre Street	Winnipeg	500,000.00
		Total credit outstanding for Canada:			500,000.00

Wrapped fields

USA

1784	McDougal	4950 P		
2177	Bonnefemme	128 Uni		
2579	Chavez	Cypres		
3266	Hanover	15 St		
3271	Massey	29 Ara		
3771	Montaigne	30 Taut		
4277	Matthews	P. O.		
4480	Samuelson	Bull Ru		
4485	Fischer	14 Wil		
4700	Harris	Old Co		
		Bra		
		s Co		
6666	Matthews	1050 1		
6954	Mayor	48 Win		
7008	Simms	Box 13		
7558	Yee	2938		
7700	Connors	27 Por		
8585	Sampson	29 Bue		
8776	Weidner	56 San		
9004	Ranier	8947 San Andreas	Klamath Falls	125,000.00
9226	Simpson	3 Pooks Hill	Dallas	75,000.00
9650	O'Hare	1 Airport Drive	Chicago	2,500,000.00
Total credit outstanding for		:		14,830,000.00
Canada				
7640	Raymond	398 Centre Street	Winnipeg	500,000.00
Total credit outstanding for Canada		:		500,000.00

Records grouped together

A Grouped Report

The Paradox report generator is interactive and highly visual. Like the rest of Paradox, most of its features are controlled by menus and special keys. When you design a report, you start with Paradox's standard report specification, a stylized version of what the actual report will look like. You can revise and refine the standard specification until you have the report you want.

Like composing a query, designing a report is **iterative**. It's easy to test, modify, and fine-tune your design until the report is just right. Once completed, you can save the report specification for future use or modification.

As a Paradox object, a report specification is automatically maintained and updated with other objects in the table's family. For example, if you restructure the table by deleting a field or changing its field type, Paradox will automatically remove that field (and any calculated or summary fields based on it) from the report.

When you choose **Report** from the Main menu, you'll see the Report menu. It has five selections:

```
Output  Design  Change  RangeOutput  SetPrinter
Send a report to the printer, the screen, or a file.
```

- **Output**: To send a report to the printer, file, or screen
- **Design**: To design a new report specification
- **Change**: To change an existing report specification
- **RangeOutput**: To output selected pages of a report
- **SetPrinter**: To choose or set up the default printer.

Since Paradox's report generator is so powerful and extensive, three chapters of *Presenting Paradox Data* are devoted to explaining it. This chapter, "Report," gives an overview of **Design, and explains Output, Change, RangeOutput**, and **SetPrinter** selections. At the end you'll find information about working with reports on a network.

For a detailed explanation of Design see Chapter 3 (Report Design Basics) of *Presenting Paradox Data*. Then Chapters 4 (Tabular Reports) and 5 (Free-Form Reports), of that book cover the design of the two major kinds of Paradox reports.

Output

```
Output  Design  Change  RangeOutput  SetPrinter
Send a report to the printer, the screen, or a file.
```

Output lets you produce a report of the information in a table. You can use Paradox's standard report or one you've previously designed with **Report/Design**. Once you've selected a report, you can choose whether to print it on your printer, display it on the screen, or file it on disk.

If you only want to output **part** of a report—perhaps to correct a printing error—use the **RangeOutput** selection instead of **Output.** When you select **Output** from the Report menu, Paradox will ask which table you want to report on.

```
Table:
Enter name of table for report, or press ↵ for a list of tables
```

Type the table name and press [Enter], or select the table from a menu as described under "Paradox Menus and Prompts" in Chapter 2 (Fundamentals).

Next you will see a menu of reports available for the table you chose. For example:

```
R  1  4  5
Standard report
```

The description that appears when each report number is highlighted is the one you entered when you designed the report. **R** stands for Paradox's preferred report (that is, the one you will get when you press Instant Report [Alt][F7]). This will be the standard report unless you have modified it.

Finally, you'll see a menu of the three places you can send the report:

```
Printer  Screen  File
Send the report to the printer.
```

- **Printer:** To print the report on your printer
- **Screen:** To display the report on the screen
- **File**: To store the report in an Ascii file on disk.

Printer

```
Printer  Screen  File
Send the report to the printer.
```

Before selecting **Printer** from the Output menu, make sure your printer is on and ready. When you select **Printer**, Paradox will begin to print the report you chose. With some reports there may be a pause as Paradox processes groupings and calculations you have set up.

If you have more than one printer, you can select **Report/SetPrinter** to choose which printer port to

use. This overrides any **Setting/Setup** entry you may have made while designing the report. If you haven't used either selection to specify a printer, the report will be sent to LPT1.

Selecting **Output/Printer** for the preferred (**R**) report is the same as displaying the table and pressing Instant Report [Alt][F7].

Once printing has begun, you won't be able to continue using Paradox until printing is complete. However, you can stop printing at any time by pressing [Ctrl][Break].

A report may be more than one page in length or width. If so, Paradox will print it one page-width at a time. That is, all the pages in the first page-width will be printed first, then the second, and so on.

By default, the pages of your report will be printed continuously. If you want Paradox to pause at the end of every page while you insert a new sheet of paper, use **Report/Change** to enter the report generator. Then select **Setting/Wait** from the Report Generator menu (see Chapter 4 of *Presenting Paradox Data*).

If you aren't satisfied with the margins, page layout, or print characteristics, you can enter the report generator and use the **Setting** options to reformat the report.

You may also use Paradox's Custom Configuration Program (see Chapter 14) to change the default page and print settings. For example, you can enter a default setup string, or tell the program to always wait at the end of each printed page.

Note that if the page width of your report is wider than the maximum line width of your printer, the extra characters may be truncated (omitted) or wrapped around (printed below or on top of the part that does fit). Since such results could be confusing, you should either

- enter the report generator and use **Setting/Page-Layout/Width** to narrow the page width; or
- (if possible) use **SetPrinter/SetupString** to enter a setup string that increases the line width of your printer.

Screen

Printer Screen File
Send the report to the screen.

When you select **Screen** from the Output menu, Paradox will begin to display the report on your screen. There may be a pause as Paradox processes any groupings and calculations you have set up.

A report may be more than one screen in length or width. If so, you will see the report one screen (23 lines) at a time. To get to the next screen, press any key. You can stop the display at any time by pressing [Ctrl][Break]. This will take you directly to the end of the current page, then to the end of the report. In each case, press any key to return to what you were doing before you selected **Report.**

If the report is wider than one page-width, Paradox will display it one page-width at a time. That is, all the pages in the first page-width will be shown first, then the second, and so on. A status indicator at the top of the screen will tell you which page and page-width you are currently viewing.

If you use PAGEBREAK keywords, they will affect the way the report is displayed. However, the printer setup string does not affect screen output. If the page width of your report is wider than the screen (80 characters), you will not be able to see the entire page width.

File

Printer Screen File
Send the report to a DOS file on disk.

File lets you send a report on a Paradox table to a DOS file on a disk. The file will be in Ascii format, suitable for inclusion in a document prepared with a word processor.

When you select **File** from the Output menu, Paradox will ask you for a file name for the report file.

File name:
Enter name to be given to the file.

Type any valid DOS file name and press [Enter]. If you don't type an extension, Paradox will add .RPT to the name you type. You may prefix the name with a drive or directory name if you wish. If you enter the name of a file that already exists, Paradox will ask whether you want to replace the existing file with the new one or cancel the output.

Once you enter a file name, Paradox will store the report in the file. Each line of the report will be stored exactly as it would be printed. At the end of each line a carriage return and line feed will be added. A report may be more than one page in length or width. If so, Paradox will store it one page-width at a time. That is, all the pages in the first page-width will be stored first, then the second, and so on. If you use PAGEBREAK keywords, page break characters will be included in the file. However the printer setup string is not included.

Design

Output Design Change RangeOutput SetPrinter
Design a new report specification.

Selecting **Design** from the Report menu lets you design a custom **report specification** (or **report spec**) for a Paradox table. This chapter gives an overview of designing a report spec. You'll find details and tutorials about this, and about the entries on the Report Generator menu for tabular and free-form types of reports, in *Presenting Paradox Data*.

Design Overview

To design a report, select **Report/Design** and follow these steps:

1. Select a table to report on.

   If the information you want is in more than one table, you can link other lookup tables into the master table, or use **Ask** to compose a query that joins all the records in one *answer* table.

   For details about master and lookup tables, see **Field/Lookup** in Chapter 4 (Designing Tabular Reports) of *Presenting Paradox Data*.

2. Select a name and description for the report.

   The description (up to 40 characters) will appear on the menu of reports, and in the page header of the report as the report title.

3. Choose whether you want a tabular or free-form report.

   Tabular reports are most useful for summarizing data in columns. Use free-form reports for mailing labels, form letters, purchase orders, and other form-oriented reports.

4. Fill out the report specification.

   You start with a standard report spec, which you can change as much or as little as you like. See "The Report Specification" in Chapter 3 (Report Design Basics) of *Presenting Paradox Data* for details.

5. Fine-tune the report.

   You can test out your design at any time by pressing Instant Report [Alt][F7] to print the current report. If the design isn't what you want, continue to refine the report spec.

6. Save the report spec.

   Press Do-It! [F2] or select **DO-IT!** from the Report Generator menu to save the report spec on disk. Then you can select **Report/Output** from the Main menu to print the report, or **Report/Change** to change the spec later.

   For details and report design tutorials, see Chapters 3, 4, and 5 of *Presenting Paradox Data*.

Change

Output Design Change RangeOutput SetPrinter
Change a report specification.

Change lets you modify a report specification that you've already designed. The process is the same as designing the report in the first place, but you start from a different point.

When you select **Change** from the Report menu, Paradox will ask which table the report is for.

Table:
Enter name of table for report, or press ↵ for a list of tables.

Type the table name and press [Enter], or select the table from a menu as described under "Paradox Menus and Prompts" in Chapter 2 (Fundamentals).

Next you will see a menu of reports available for the table you have chosen. For example,

R 1 4 5
Standard Report

The description that appears when each report number is highlighted is the one you entered when you designed the report. **R** stands for Paradox's preferred report (the standard report unless you have modified it).

Next you'll see the prompt for a description of the report. The current description will already be filled in. For example,

Report description: Mailing labels by zip code
Enter a new description for report, or press ↵ to leave it unchanged.

You can press [Enter] to accept the existing description, or use [Backspace] or Field View [Alt][F5] or [Ctrl][F] to change it. Changing the description will not affect the page title in the report spec, even if it is the same as the original description.

Finally, the report spec itself will appear on the screen. From there, changing it is the same as designing it in the first place. See Chapters 3 through 5 of *Presenting Paradox Data* for details. When you're finished changing the report spec, press Do-It! [F2] or select **DO-IT!** from the Report Generator menu to save your changes.

RangeOutput

Output Design Change RangeOutput SetPrinter
Send specified pages to the printer, the screen, or a file.

RangeOutput lets you output selected pages of a report. This is especially useful if you've run out of paper or spotted an error in the middle of the printout—say on page 74—and you would rather not reprint the first 73 pages.

RangeOutput works exactly the same as **Output**, with one exception. After you make a selection from the Output menu—just before Paradox sends the report to the destination you've chosen—it asks which pages to start and end with:

Beginning page number: 1
Enter first page number to be printed.

Ending page number:
Enter last page number to be printed, or press ↵ for the last page of report.

You can press [Enter] in either case to accept the default starting or ending point (the first or last page of the report, respectively). Once you enter a page range, Paradox will send all page-widths of the pages you've specified to the destination you've chosen.

If you've used **Setting/PageLayout/Length** to specify a continuous (**C**) page length, the beginning and ending page number refers to **records**, not pages. For example, if you were printing mailing labels, specifying a beginning page of 74 would start printing with the 74th label in the report. (The numbering refers to **report** records, not table records. These may not be the same, especially if the report contains groups.)

SetPrinter

Output Design Change RangeOutput SetPrinter
Choose a setup string or printer port to be used for printed output.

SetPrinter lets you select and set up a printer to print reports. It gives you the flexibility either to use the printer port and setup string stored with a particular report spec or to specify a printer or setup string that will override the stored setup information at the time of output. It also allows you to specify a printer port and setup string that will apply when you press Instant Report [Alt][F7].

When you select **SetPrinter** from the Report menu, you will see a submenu with two selections:

Regular Override
Use the printer port and setup string stored with the report spec.

- **Regular**: To use the printer port and setup string stored with the report specification.
- **Override**: To specify a printer port and setup string to be used at the time of output that will override the printer port and setup string stored with the report.

Regular

Regular Override
Use the printer port and setup string stored with the report spec.

The **Regular** option of the SetPrinter menu is the default setting. When **Regular** is selected, Paradox uses the printer port and the setup string stored with a report specification to tell it how to print the report. If no setup information is stored with the report, it will be sent to LPT1 with no setup string.

Override

Regular Override
Override the printer port and setup string stored with the report spec.

Selecting **Override** from the SetPrinter menu lets you temporarily override the setup information stored with any report that you are printing. It is useful when you want to change the setup information stored with a report without having to change the report itself.

For example, let's say you want to get a quick copy of a report printed on a high speed line printer connected to a network. The line printer is connected to port LPT2 on the network. Rather than entering the report generator and changing the report spec, you can use **SetPrinter/Override** to temporarily redirect the output to LPT2.

SetPrinter/Override also lets you specify a printer port and setup string that will be used when you press Instant Report [Alt][F7].

When you select **Override** from the SetPrinter menu, you'll see a further submenu with two choices:

PrinterPort SetupString FormFeed
Choose a printer port

- **PrinterPort**: To specify which printer port you want to use
- **SetupString**: To enter a setup string that prepares or configures the printer
- **FormFeed**: To specify whether to use formfeed or linefeed characters to skip to the top of each new page.

The port, setup string, and form feed setting you enter will take effect whenever **SetPrinter/Override** is selected. They will have no effect when you select **SetPrinter/Regular.**

PrinterPort

PrinterPort SetupString FormFeed
Choose a printer port

When you choose **PrinterPort**, you will see a menu containing the printer ports you can select:

Printer port:
LPT1 LPT2 LPT3 COM1 COM2 AUX

Select the printer port you want from the menu. The default is LPT1.

SetupString

PrinterPort SetupString FormFeed
Enter a setup string to be sent to the printer.

When you choose **SetupString**, Paradox will prompt you to type the setup string you want:

Setup string:
Enter the setup string to be sent to the printer before printing the report

The setup string you enter can be up to 175 characters long. You can use Field View [Alt][F5] to edit it. When you are finished entering, press [Enter] to complete the process. See **Setting/Setup** in Chapter 4 (Designing Tabular Reports) for a detailed discussion of setup strings and how to construct them.

Formfeed

PrinterPort SetupString Formfeed
Override the default setting for formfeeds.

When it reaches the last line of text on a page, Paradox normally uses linefeed characters to skip to the top of the next. **Formfeed** lets you specify

whether to use a formfeed character to do this instead. This is particularly useful with certain kinds of laser printers.

To select formfeeds or linefeeds, you choose:

No Yes
Do not use a formfeed instead of linefeeds at the end of printed pages.

- **No**: To use linefeeds at the end of printed pages (default setting)
- **Yes**: To use a formfeed instead.

Reports on a Network

While you are designing, changing, or outputting a report on a network, Paradox automatically places a prevent full lock on the table on which the report is based. This is the least restrictive type of lock and allows for maximum concurrent use of the table.

If another user is already performing an operation that has placed a full lock on the table (such as emptying or restructuring it), you will have to wait to work on your report until the operation is finished and the lock is released.

If another user is changing a report specification, you will not be able to access it for any reason until he or she has finished making changes.

On a network, the owner of a table may restrict access to that table's reports. In this case, you must present a password granting you sufficient rights to the table before you can design or change its reports. See **Tools/More/Protect** in Chapter 10 (Tools) for more on restricting access to reports.

Output and RangeOutput

When you use **Report/Output** or **RangeOutput** to print, display, or file a report on a table that other users are working with, Paradox takes a "snapshot" of the table and bases the report on the snapshot. (To speed processing, the snapshot is not taken if no one else is using the table.) This lets you produce reports while other users are viewing or even changing the records in a table.

If another user happens to modify the table during the brief time the snapshot is being created, Paradox will try to take the snapshot again until it is successful. You'll see a message each time Paradox tries to output the report. If you want to cancel the automatic retries, press [Ctrl][Break].

Design and Change

While you are using **Report/Design** or **Change** to work with a report spec, Paradox places a full lock on that report in addition to the prevent full lock it places on the table. This prevents other users from printing, changing, copying, or using the report in any other way. However, they may still work with the table on which the report is based.

SetPrinter

Report/SetPrinter is especially useful on a network with multiple printers, since it lets you change printers without changing the report spec. **SetPrinter** sets no locks on tables or reports.

Chapter 6

Create

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Create a new table structure.

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All information in a Paradox database is stored in tables consisting of records (rows) and fields (columns). The **Create** selection is used to create new tables to store information. The tables you create are your own; you can define the fields to contain exactly the information you need to work with.

When you choose **Create** from the Main menu, Paradox will ask for the name you want to assign the new table.

```
Table:
Enter new table name
```

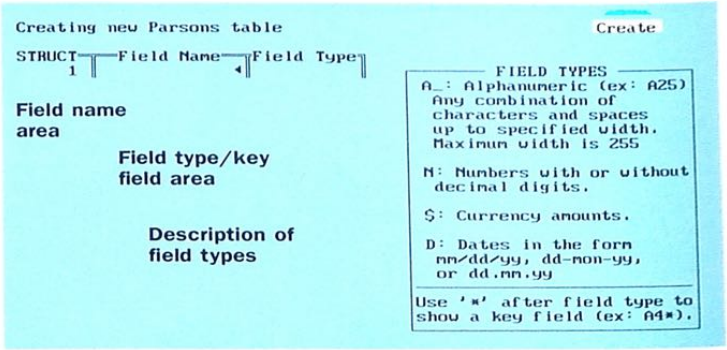
Type the new table name and press Enter (the rules for naming tables are listed under "Paradox Objects" in Chapter 2 (Fundamentals) of this manual). You'll see an image in which you can define the structure of your new table by naming and describing its fields. (Since the image is a temporary Paradox table called *struct*, you're actually using one Paradox table to define another.) When you have finished, press Do-It! F2 and Paradox will create the new table.

If you are an experienced database designer, you will appreciate the ease with which Paradox lets you achieve standard normal form.

Defining the Table Structure

To define the fields of a table, fill out the table structure image shown below. For each field, enter its name, field type, and whether it is a key field. Brief descriptions of the major field type choices appear on the screen next to the table structure.

You may edit your entries just as you would any Paradox table (see "Editing" in Chapter 2 of this manual).

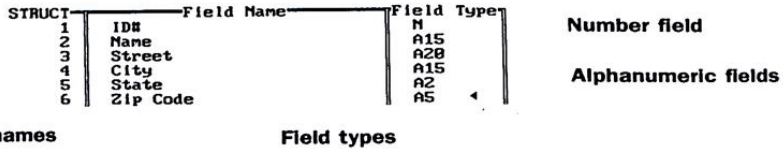


Field Names

In the area labelled *Field Name*, type each field name of up to 25 characters. Special rules for naming fields are listed under "Paradox Objects" in Chapter 2 (Fundamentals) of this manual.

6-1. Creating a Table

Suppose you want to create a *supplier* table to store the *ID#, Name,* and *Address* of all suppliers to the Luxury Gifts Department.



Field Types

In the area labelled *Field Type*, choose a field type, which determines the kind of information that can be entered into the field. The choices are

A alphanumeric (1-255 characters)

N numeric

$ currency

S short number

D date

These choices (except for the special type **S**) are listed and described briefly on the right side of the screen. Complete information about field types is contained under "Paradox Objects" in Chapter 2 (Fundamentals) of this manual.

Key Fields

Key fields are used to identify records. While they are strictly optional, a key gives you the following benefits:

- prevents duplicate values in the key field
- keeps the table sorted according to the values in the field
- creates a primary index on that field which can speed queries and other operations

To establish a field as a key, type an asterisk (*) after its field type. A key field must be the first field in the table.

You can see how a key prevents duplicate values by coediting the sample *customer* table, which is keyed on the *Cust ID* field.

Suppose you try to add a new record with a Cust ID of *1386*, the same as *Aberdeen*. When you press [↵] to try to post the record, Paradox will tell you that there is a key violation. If you want to allow duplicate records in a table, don't use a key.

Similarly, you can see how a key keeps records in sorted order by adding a record to the end of the customer table. When you press Do-It! [F2], Paradox will move the record from the end to its correct position in the table according to its Cust ID.

The record size limitation of keyed tables is 1350 (instead of the 4000 bytes for non-keyed tables).

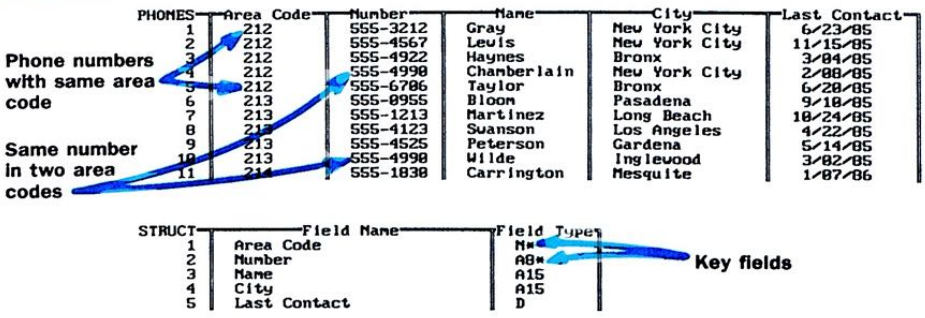
Multi-field Keys

A key can consist of more than one field in a table, in which case it is called a **multi-field** or **concatenated** key. Again, the key fields must be the first fields in the table, listed in the order in which you want them keyed. The first field is called the **primary key field**.

Records in a table with a multi-field key may have duplicate values in some of the key fields, but not all. When the table is sorted, the other key fields serve as "tie-breakers" for records that have identical primary key values.

6-2. A Multi-field Key

Suppose the telemarketing division of the Luxury Gifts department maintains a "reverse telephone directory" in which prospective clients are listed by phone number. This large *phones* table looks something like this:



PHONES	Area Code	Number	Name	City	Last Contact
1	212	555-3212	Gray	New York City	6/23/85
2	212	555-4567	Lewis	New York City	11/15/85
3	212	555-4922	Haynes	Bronx	3/04/85
4	212	555-4990	Chamberlain	New York City	2/08/85
5	212	555-6706	Taylor	Bronx	6/28/85
6	213	555-0955	Bloom	Pasadena	9/10/85
7	213	555-1213	Martinez	Long Beach	10/24/85
8	213	555-4123	Swanson	Los Angeles	4/22/85
9	213	555-4525	Peterson	Gardena	5/14/85
10	213	555-4990	Wilde	Inglewood	3/02/85
11	214	555-1830	Carrington	Mesquite	1/07/86

STRUCT	Field Name	Field Type
1	Area Code	N*
2	Number	A8*
3	Name	A15
4	City	A15
5	Last Contact	D

The division normally works with the *phones* tables sorted by area code and number, as shown in the figure. Thus it would be convenient to key this table so that it is kept in order.

But what fields should comprise the key? Of course, Area Code could not be a single key, since you can expect many records to have the same area code. Number could not be a single key, since two prospects in different area codes might have the same number. (Similarly, neither Name, City, nor Last Contact could be a single key; besides, they wouldn't maintain the table in the order you want.)

The preferred way to design this table is to define a double key consisting of Area Code and Number. By definition, no two phone lines can have duplicate area codes and phone numbers. Records will be sorted by area code, then (within each area) by phone number. Paradox will assure that no records are entered with the same area code and number.

The Create Menu

Borrow Help DO-IT! Cancel
Borrow the structure of an existing table.

While filling out the table structure, you can display the Create menu at any time by pressing Menu [F10]. It contains these choices:

- **Borrow**: To borrow the structure of another table
- **Help**: To display help about defining and editing the structure of a table
- **DO-IT!**: To create the table as defined in the structure image and return to the main workspace
- **Cancel**: To cancel the table creation and return to the main workspace

Borrow

If the table you want to create is like a table you already have created, you can **borrow** all or part of its structure, saving you the trouble of re-typing it.

To borrow the structure of a new table from an existing one:

1. Select **Create** from the Main menu, type the name of the table you want to create, and press [Enter].

   You will see the blank table structure image.

2. Press Menu [F10] to obtain the Create menu.
3. Select **Borrow**.

   Paradox will prompt you for the name of the table to borrow from:

Table:
Enter name of table to borrow structure from, or ↵ for a list of tables.

4. Type the table name or select it from a menu.

   All of the field names, field types, and key fields (if any) from the named table will be inserted in the new table structure at the cursor position (above the current record).

5. Add, edit, or delete the fields in the structure to suit the requirements of the new table.

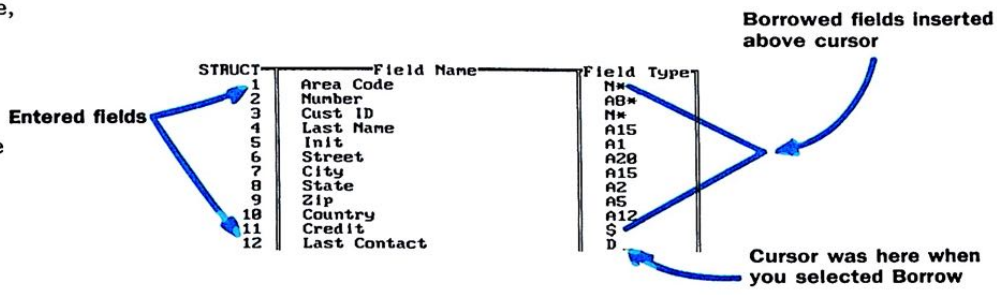
You may borrow a structure from more than one table. When you borrow a structure, the borrowed field definitions are always inserted in the new structure directly above the cursor.

If you insert a keyed structure in the middle of an existing structure, remember that key fields must always be the first fields in a table. You may have to remove the key designation (*) or change the order of the fields.

6-3. Borrowing Structure

Here's how the *phones* table structure would look if you entered the Area Code, Number, and Last Contact fields, then borrowed the structure of the *customer* table while the cursor was in the Last Contact field.

You could then edit the structure image to adapt the field definitions for the *phones* table.



Tips on Creating Tables

Planning is always the first step in creating a table. You need to decide what information the table should contain and how it should be laid out.

Although planning is important, Paradox makes it easy to change the design of your tables. If, after using a table, you decide that you need more fields, or that an existing field is too small or the wrong type or even not needed, you can always redesign the table. See "Restructure" in Chapter 7 (Modify) for details.

When you begin to design a table, keep these thoughts in mind:

- **Be complete**. Try to include fields for all the information you think you'll work with or need. On the other hand, try not to clutter the table with fields of information you don't need. Remember, you can always add or remove fields later.
- **Don't rush to put all the information in one table**. It's usually better to create several tables, each with a few fields, rather than a single large table. Because Paradox tables can easily be linked, small, simple tables are often easier to work with than tables with many fields. Consider creating several tables to keep them simple.
- **Keep your tables familiar**. It's often best to create tables that correspond to the kinds of information you already use. They can reflect files or forms you currently keep on paper, like employee files or order forms.
- **Create links**. Build in ways of joining tables. Include common fields in tables you might want to link. (The common fields need not have the same name.)
- **Avoid redundancy**. Beyond these table links, however, don't unnecessarily duplicate information between tables.

Structure Your Tables

When you design your database, think first about the **classes** of people or things you work with.

Suppose you are the sales director for a national corporation. Your market is currently divided into four regions, East, Central, South, and West. Each region is divided into territories made up of between one and three states. Each territory is assigned one sales representative, who works out of the regional office and reports to the regional manager.

If you're like many database users, the great temptation is to put all the information you need to know into one large table.

Although all the relevant information is in this table, it may not be easy to retrieve or update as the department grows and changes. For example:

1. What if you hire a second employee named Milford? How will you tell them apart?
2. Suppose the eastern region relocates from Boston to New York. You'll have to change the location and phone number of every employee and rep in the region.
3. Suppose you want to know who's responsible for customers in Arkansas. First you'll have to remember whether its abbreviation is *AR* or *AK*. Then you'll have to search for this code in three separate fields (State1, State2, and State3).
4. What if you redraw the boundaries so that Maine, New Hampshire, Vermont, and Massachusetts form a single territory? You'll have to restructure the table to include a State4 field.
5. Suppose several sales representatives resign. Once you remove them from the database, you'll have no record of how their territories were constructed.

You can see that it might be inconvenient to use and maintain this database.

The problem with the large *staff* table is that it's undifferentiated. It contains information about several different classes of things: employees, regions, territories, and states.

The Kitchen Sink Approach

STAFF

	Name	Position	Location	Phone	State1	State2	State3	Salary
1	Milford	Rep	Boston	617 555-3733	ME	NH	VT	36,000.00
2	Janacek	Sr Rep	Chicago	312 555-6700	IL			42,000.00
3	Rorem	Mgr	Atlanta	404 555-4321				48,000.00
4	Bacon	Rep	Atlanta	404 555-4321	MS	LA	AR	33,000.00

Instead of creating one big table, you could create a few small and discrete tables:

- *employee* contains information about all employees, including ID number, name, position, and salary
- *region* contains the code number, name, location, phone number, and manager ID for each region
- *terr* identifies each territory by a code number, and tells which region it is in and which representative it is assigned to
- *state* identifies each state by code and name, and tells which territory it is in

The four tables that, together, contain all the information about the sales staff are small, simple, and much easier to work with. When you work with information spread over several tables, you can easily join or link them together using Paradox's powerful query capability.

Notice how the rows in each table have a unique identifying key field. This helps to avoid confusion among similar records and makes it efficient to relate the information in one table to that in another.

Consider how this differentiated database solves the problems we encountered with the *staff* table:

1. Two employees named Milford can be differentiated by their employee code numbers.
2. If the eastern region moves to New York, you need to change the location and phone number only once in the *region* table.
3. To find out who's responsible for Arkansas, join the *employee*, *state*, and *terr* tables. You can learn the territory code from *state*, the rep code from *terr*, and the salesperson's name from *employee*.
4. If you redraw territory boundaries, simply change the territory codes for the affected states in the *state* table.
5. Territory divisions are stored in *state* and are not affected by changes in *employee*.

In computer circles, this kind of organizing of information is called **normalization**. A normalized table is small, simple, and discrete, and contains a minimum of redundant information. Each field contributes additional and necessary information. Changes can be made easily.

Individualize Your Database

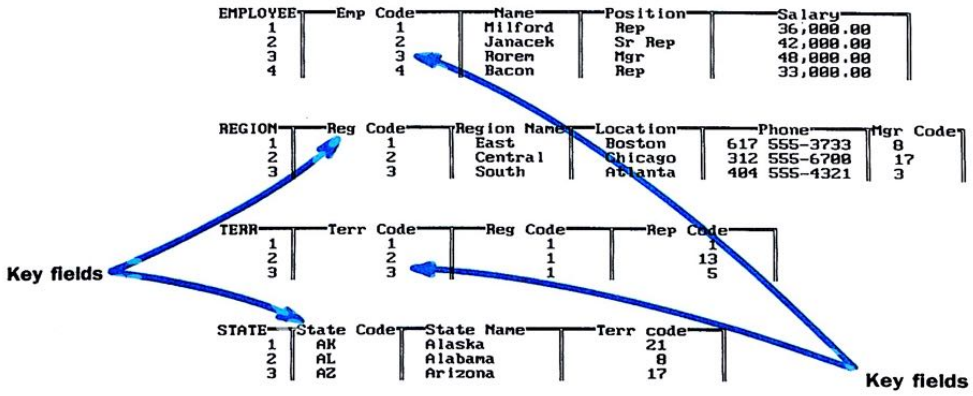
The design of your database should reflect the way you do business. What works for you may not work for someone else.

Suppose your employees' salaries depend entirely on their job title: All sales reps make $36,000, all senior reps make $42,000, all managers make $48,000, and so on. In a case like this, you would not want a salary field in the employee *table* (as in the example BELOW), since salaries are associated with job titles rather than with individual employees. Consider the potential complications:

- If you raise the salary of managers, you will have to change each manager's salary in the *employee* table.
- Suppose all sales reps are promoted to senior reps, leaving no sales reps in the *employee* table. When you hire more sales reps, the database will not tell you what their salary should be.

Instead, place the salary information in a separate *salary* table with two fields, Position and Salary. To find an employee's salary, you can join

Normalized Tables



employee and *salary* by placing an example element in the Position field of both tables. If you raise the salary of managers, you can simply change one figure in the *salary* table. If you promote all the sales reps, the salary for that position will still be stored in *salary*.

Salary Based on Position

EMPLOYEE	Emp Code	Name	Position
1	1	Milford	Rep
2	2	Janacek	Sr Rep
3	3	Rorem	Mgr
4	4	Bacon	Rep

SAL	Position	Salary
1	Rep	36,000.00
2	Sr Rep	42,000.00
3	Mgr	48,000.00
4	Trainee	24,000.00

Creating Tables on a Network

On a network, Paradox will automatically place a full lock on a table you are creating. This means that no other user can create or rename a table with the same name until you are finished creating your table.

If you are borrowing another table's structure, a prevent full lock briefly will be placed on the table you are borrowing from. You will not be able to borrow the table's structure if another user has placed a full lock on it.

Modify

View Ask Report Create **Modify** Image Forms Tools Scripts Help Exit

Sort or edit a table, enter new records or restructure a table.

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The **Modify** selection is used to make changes to the content or structure of a table. When you choose **Modify** from the Main menu, you will see the Modify menu.

```
Sort  Edit  Coedit  DataEntry  MultiEntry  Restructure
Sort records in a table.
```

The options include

- **Sort**: To rearrange the records in a table.
- **Edit**: To insert, delete, or modify records in a table or a multitable form
- **Coedit**: To allow two or more users to simultaneously edit a table or a multitable form
- **DataEntry**: To add a group of new records to a single table or a multitable form
- **MultiEntry**: To add a group of new records to two or more tables at once
- **Restructure**: To rename, remove, modify, or add to the fields in a table

Select the option you want. Paradox will prompt you for the name of the table you want to work with; for example,

```
Table:
Enter name of table to edit, or press ↵ to see a list of tables.
```

Type the table name and press [Enter], or select the table from a menu as described under "Paradox Menus and Prompts" in Chapter 2 (Fundamentals) of this manual.

Sort

```
Sort  Edit  Coedit  DataEntry  MultiEntry  Restructure  Main
Sort records in a table.
```

Paradox allows you to specify the order it uses to sort records in your tables. There are four sort orderings available; they are described in "International Features" in Chapter 2 (Fundamentals). The sort ordering most appropriate to the country group specified at the time of installation is set automatically.

Changing the Sort Order

Should it be necessary to do so, the sort ordering used by Paradox can be changed. The implications of changing the sort ordering and the procedure for doing so are described in Chapter 14 (Advanced Topics). Chapter 14 also includes a table that shows the sequence of characters in each of the four available sort orderings.

Keyed Tables

Keyed tables are described in Chapter 6 (Create). If a table contains no key fields, its records are kept and displayed in the order in which they were originally entered. If you change the original order of records by sorting the table or by adding new records Paradox will keep the table in the new order.

The records in a keyed table are automatically sorted in ascending order according to the values in the key field or fields. If the table contains more than one key field, the records are sorted by the primary (first) key field, with ties settled by the other key fields.

Sorting a Table

You can use the **Modify/Sort** selection to rearrange the records in any table. If the table is not keyed, you may choose whether to sort within the table (changing its order) or into a new one (leaving the current order intact in the original table).

If the table is keyed, you must sort its records into a new table; otherwise the sort order established by the key fields might be violated. The new table (into which you sorted the keyed records) will not be keyed.

When you choose **Modify/Sort** and enter a table name, what happens next depends on the table you chose. If it has no key fields, Paradox will give you a choice of sorting within the same table, or into a new one:

```
Same  New
Place results of the sort in the same table.
```

If the table has keyed fields, or if you choose to sort into a new table, Paradox will prompt you for the new table name:

```
Table:
Enter name for new sorted table.
```

The Sort Form

Then you will see a sort form for the table like the one in Example 7-1. The form, which lists the fields of the table, allows you to choose how to sort the records. When you are done filling out the form, press Do-It! [F2].

Field Order

You can sort the records of a table according to their values in one or more fields. To sort by a single field, type a **1** next to that field name on the sort form. To sort by additional fields, type **2**, **3**, and so on next to them.

Think of these additional sort fields as "tie-breakers." If two records have the same values in the primary sort field, they will be arranged according to their values in the second sort field. If two records have the same values in the first two sort fields, they are sorted by the third, and so on down the line.

If you leave the sort form blank, the table will be sorted left to right, in ascending order.

Ascending or Descending Order

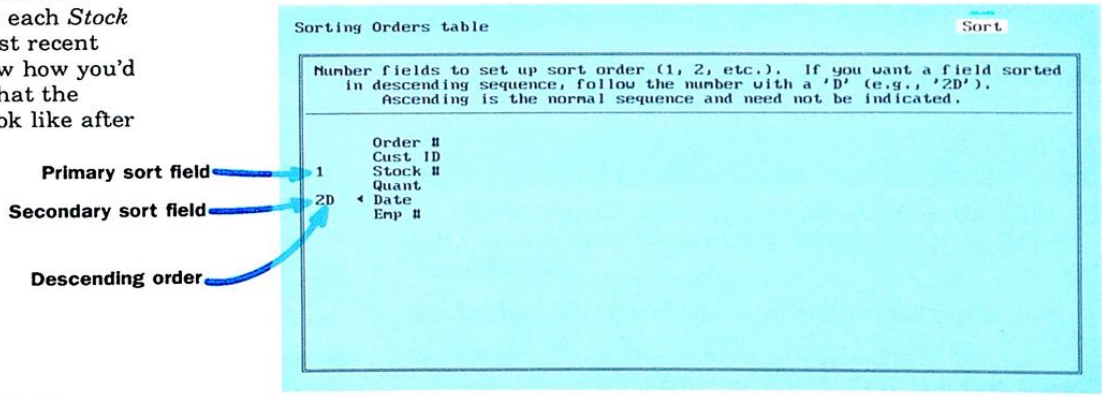
You may choose whether the records should be sorted in **ascending** or **descending** order. Paradox normally sorts in ascending order. This means that:

- **number (N, $,** and **S)** fields are sequenced from lowest to highest number
- **alphanumeric (A)** fields are sequenced alphabetically according to the currently-set sort ordering
- **date (D)** fields are sequenced from earliest to latest date.

To sort in **descending** order (in which the above sequences are reversed), type a **D** directly after the sort field number on the sort form.

7-1. Sorting a Table

Suppose you want to sort the *orders* table by *Stock #*, and within each *Stock #* by order date with the most recent orders first. The figures show how you'd fill out the sort form, and what the sorted *orders* table would look like after you pressed Do-It! [F2]



Records arranged by Stock #

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
1	2288	4277	130	1	2/28/87	775
2	5119	7008	235	1	3/04/89	517
3	3885	9004	244	5	09/04/89	422
4	4492	5341	244	3	12/24/88	146
5	8933	9226	422	1	4/28/87	422
6	3351	3266	519	1	12/16/90	422
7	6975	6666	519	3	6/24/89	517
8	7643	6954	519	1	4/30/88	146
9	1442	9004	519	2	10/27/86	146
10	1108	3128	519	2	5/31/86	775
11	9554	3266	558	15	7/27/87	146
12	8070	6125	632	8	6/04/90	146
13	1574	2177	632	1	11/22/89	775
14	6235	2779	890	1	8/01/88	517
15	9226	1784	983	1	1/14/88	517

Within Stock #, records in reverse chronological order

The Sort Menu

Help DO-IT! Cancel
Help with sorting a table.

While filling out a sort form, you can display the Sort menu at any time by pressing Menu [F10]. It offers these choices:

- **Help**: To get help about sorting a table
- **DO-IT!**: To tell Paradox that you have completed the form and that the sort should proceed
- **Cancel**: To interrupt the process of specifying a sort and return to the main workspace.

Sorting on a Network

When you select **Modify/Sort** on a network, Paradox automatically places a write lock on the table. This means that other users cannot modify its contents or structure. If someone else on the network has started an operation that requires either a full lock or a prevent write lock on the table, you won't be able to begin sorting until that user has finished working with it.

If you are sorting one table into another (as is required when you are sorting a keyed table), Paradox automatically places a full lock on the target table for the duration of the sort.

Edit

Sort Edit Coedit DataEntry MultiEntry Restructure
Insert, delete, or change records in a table.

Tables on the screen are protected from inadvertent changes. To change information in a table, there are two modes you can use: Edit and Coedit. The major distinction between Edit and Coedit modes is that when you are in Edit, you have exclusive access to the table you are editing, while Coedit allows two or more users to make changes to the same table simultaneously. Coedit mode is described under "Coedit" later in this chapter.

To enter Edit mode, either select **Modify/Edit** from the Main menu, or press Edit [F9] when the table or tables you want to edit are on the workspace.

When you enter Edit mode, all of the images on the workspace (except query forms) are available for editing. If you are viewing more than one image of a single table, the duplicates are removed from the workspace in order to prevent inconsistent versions of the same table.

The editing process is exactly the same whether you edit through a table or a form. (For special restrictions on editing with a multitable form, see "Editing Records in Multitable Forms" later in this section.) When you are finished editing, press Do-It! [F2] or select **DO-IT!** from the Edit menu to save your changes. Alternatively, you can select **Undo** or **Cancel** from the Edit menu to undo your changes.

Moving Around

When you are in Edit mode, you can use Up Image [F3], Down Image [F4], and the numeric keypad to move the cursor around the workspace in the usual ways. (For more information, see "The Keyboard" in Chapter 2 of this manual, especially the fold-out diagrams.) In addition, you can press:

- any character, which will be added at the end of the current entry
- [Backspace] to erase the character to the left of the cursor
- [Ctrl][Backspace] to erase the current field
- [Del] to erase the current record
- [Ins] to insert a blank new record before the current one
- [↓] from the last row of the table, to add a blank new record at the end.

Changing Field Values

If you want to change an entire value in a field, move the cursor to it and press [Ctrl][Backspace]. The old field value will disappear. Type the new value.

If you want to change only part of the field value, move the cursor to it. The cursor will be at the end of the field. Use [Backspace] to erase the old value from the end, one character at a time. When the incorrect portion of the old value has been erased, type the changed portion of the value.

Field Editing

If you would rather edit from within a field rather than from the end, press Field View [Alt][F5] or [Ctrl][F] for field editing. The cursor will become a small box, indicating that you are in field view. The keys used in field editing, and the differences from normal Edit mode, are described in Chapter 2 and shown in Table 2-1.

When you are done editing the field, press [Enter] to accept the changes you have made. You will still be in normal Edit mode when you finish. Note that while you are field editing, you can't move the cursor to another field without ending field view first.

Editing Values that Don't Fit

Sometimes the value in a field won't fit in the space allotted to it on the screen. Depending on the circumstances, the value may be displayed as asterisks (***). In other cases, you may see the beginning of the value, with the rest hidden beyond the field boundary. In Edit mode, when you land on a field with a partially hidden value, the cursor will appear at the beginning of the value (instead of at the end) and an asterisk (*) will appear after the value. In such cases, to make sure you know just what you're editing, you must use Field View [Alt][F5] to edit the values that are hidden.

Inserting Records

To insert a blank new record, press [Ins]. The new record will appear above the current record. If the cursor is in the first record of the table, the new record will become the first record.

Since all the records in a table can be changed while you are in Edit mode, you should not use **Edit** to enter large numbers of new records. Instead, use **Modify/DataEntry**, which allows you to enter new records without the possibility of accidentally modifying existing ones.

Deleting Records

To delete a record, move the cursor to the unwanted record and press [Del]. The entire record will be removed. You can recover it by pressing [Ctrl][U] or selecting **Undo** from the Edit menu before leaving Edit mode.

If any blank records remain at the end of the table when you end the edit, they will be deleted.

Undoing Changes

To undo changes you have made to records in Edit or Data Entry mode, select **Undo** from the menu or press Undo [Ctrl][U]. When you edit or do data entry, Paradox keeps a **transaction log** of all changes or new entries you make. Each time you select **Undo** or press Undo [Ctrl][U], you undo **one transaction** in reverse order; that is, the first **Undo** will undo the most recent transaction, the next will undo the second most recent, and so forth.

The beginning of a transaction is defined as the moment you move the cursor to a particular record or create a new record by pressing Insert [Ins]. The transaction ends when you leave that record or delete it. Thus one record may be involved in several transactions during a single editing or data entry session. Also note that when using multitable forms, more than one record may be involved in a single transaction.

The Edit Menu

Image Undo ValCheck Help DO-IT! Cancel
Resize or reformat an image; move to a field, record, or value; pick a form.

While you are editing, you can display the Edit menu at any time by pressing Menu [F10]. It contains these choices:

- **Image**: To rearrange information on the screen
- **Undo**: To undo changes to the current image only, one transaction at a time (see the previous section on "Undoing Changes" for details)
- **ValCheck**: To set requirements for entries in a field, and to look up and fill in values from other tables (see "Validity Checks" at the end of this chapter for details
- **Help**: To obtain help about editing a table
- **DO-IT!**: To complete the edit session, accept the changes, and return to the main workspace
- **Cancel**: To terminate the edit session, undo the changes to all the images on the workspace, and return to the main workspace.

Image

Image Undo ValCheck Help DO-IT! Cancel
Resize or reformat an image; move to a field, record, or value; pick a form.

The **Image** selection on the Edit menu is the same as the **Image** selection on the Main menu. It lets you

- resize an image on the screen
- format, resize, or rearrange the fields in the image
- select a form to display
- move to a named field, record, or value

while editing. For details, see Chapter 8 (Image) of this manual.

ValCheck

Image Undo ValCheck Help DO-IT! Cancel
Define or clear validity checks for the current image.

ValCheck lets you set, clear, and save requirements and default values for the entries in a field. It also lets you look up and fill in values from another table.

For details on **ValCheck**, see the section on "Validity Checks" at the end of this chapter.

Editing Support and Shortcuts

Paradox helps you enter and edit number and date values by anticipating and checking what you type. You can press [Space] to enter part or all of these kinds of values. In addition, there are shortcuts that make any type of field easier to edit.

Number Fields

You can use several conventions while entering or editing number (**N** or **$**) values:

- **Decimal point.** Besides typing **.** (**,** in the international format), you can also press [Space] to enter a decimal point.
- **Negative values.** You can indicate a negative number by preceding it with a – sign or by enclosing it in parentheses. If the field already contains a left parenthesis, pressing [Space] [Space] will fill in the decimal point and right parenthesis.
- **Whole Number Separators.** Depending on the currently set numeric format (see "International Features" in Chapter 2), you can use commas or periods to separate groups of three whole digits. If you do, Paradox will make sure the separators are correctly placed before you can leave the field. For example, you can enter 1,234,567 but not 1,234,56.
- **Fractional Currency.** If you omit the fractional part of a $ value, Paradox will add .00 for you.

Note that the way you enter a value doesn't change the way Paradox displays it. For example, **$** values are normally displayed with separators or parentheses, **N** values without them. If you omit separators when entering a **$** value, Paradox will supply them when you leave the field. If you enclose a negative **N** value in parentheses, Paradox will change it to a – sign. You can use **Image/Format** to change the way values are displayed.

Date Fields

You can use several conventions while entering or editing date (**D**) values:

- **Formats**. You can enter dates in either *MM/DD/YY, DD-Mon-YY,* or *DD.MM.YY* format. That is you can enter February 6, 1988 as either **2/6/88**, **6-Feb-88**, or **6.02.88**.
- **Legal dates**. Paradox won't let you enter a date that doesn't exist, like **31-Apr-88**. It knows about leap years and leap centuries.
- **Current year**. If you omit the year while entering a date value, Paradox will insert the current year.
- **Components of today's date**. The month, day, and year of a date value are called its components. Pressing [Space] will fill in the rest of the current component with today's date, along with the /, -, or . that follows, if any.

  Thus you can press [Space] three times to enter today's date (month, day, year). Or you can press [Space] to enter the current month and a /, type a day, press [Space] again to fill in the second /, and press [Space] once more to fill in the current year. Paradox assumes you will enter date values in the field's display format, but you can switch to the other format by typing at least one -, /, or ., whichever is appropriate. For example, suppose values are being displayed in the form *MM/DD/YY*. If you type a day and a -, Paradox will understand that you are using the *DD-Mon-YY* format. Pressing [Space] now will enter the current month (in the form *Mon*) and a -.
- **Month name**. The first letter of the month name will automatically appear as a capital letter. You may use [Space] to enter other letters; if there's more than one possibility, the earlier month will appear.

Suppose you type a **j**; Paradox will display it as **J**. Pressing [Space] will enter an **a** (anticipating **Jan**). Suppose you [Backspace] over the **a** and type **u**. Pressing [Space] again will enter an **n** (**Jun**). You could [Backspace] again and type **l** if you wish.

As with numbers, the way you enter a date value doesn't change the way Paradox displays it. Suppose values in the field are being displayed in the form *MM/DD/YY*. If you enter a date in the form *DD-Mon-YY*, Paradox will change it to *MM/DD/YY* when you leave the field. You can use **Image/Format** to change the way values are displayed.

All Fields

Several shortcuts will help you edit values in any kind of field.

Ctrl D **Ditto**

- Ditto. Pressing Ditto [Ctrl][D] while entering a field will copy the value from the same field in the previous record. This is especially handy when you have many duplicate values in a column.

Ctrl Z **Zoom**

- **Zoom**. Pressing Zoom [Ctrl][Z] lets you quickly search a table for a particular value you want to edit. To locate a value, place the cursor in the field you want to search and press Zoom[Ctrl][Z]. You'll then be prompted to enter the value you want to search for:

```
Value:
Enter value or pattern to search for.
```

  Enter the value and press [Enter]. The cursor will move to the first occurrence in the table of the value you've specified.

  You can use Paradox's wild card operators to establish patterns for the search. For instance, if you wanted to search for customers whose last name starts with **M** and ends with **s**, you could enter **M..s**. To search for subsequent occurrences of the same value, press Zoom Next [Alt][Z]. For details on Zoom see the discussion of **Image/Zoom/Value** in Chapter 8 (Image).

Alt Z **Zoom Next**

- **Pictures**. If you have used **ValCheck/Picture** to set a picture format for a field, Paradox will enter all constants automatically. For example, if you have supplied the picture ###-#### for a telephone number, the - will appear automatically when you type the third digit. You may [Backspace] over it if you wish.

Editing Records in Multitable Forms

As discussed in Chapter 3 (View), you can design and view data on forms that show more than one table. A multitable form is always based on a **master** table—the one for which the form was designed. Forms for other tables are **embedded** on the master form. The master and embedded forms may be **linked** (logically associated) or **unlinked**. See Chapter 2 (Designing Forms) of *Presenting Paradox Data* for complete details on designing multitable forms.

The keys and procedures you use to edit tables are exactly the same whether you edit through table view, a single-table form, or a multitable form. You select a multitable form to edit in the usual way—by using **Modify/Edit**, or **View** and Edit [F9], to display the master table in edit mode, then selecting **Image/Pickform**.

The master and embedded forms are each separate images on the screen. You can use Up Image [F3] and Down Image [F4] to move from one image on the form to another. Once on a particular image, you can move around, change field values, insert and delete records, and undo changes just as described at the beginning of this section on Edit.

There are two exceptions:

- One or more of the tables on the form may be designated as DisplayOnly. If so, these tables are for viewing only, and you won't be able to edit their records. See Chapter 2 (Designing Forms) in *Presenting Paradox Data* for details on DisplayOnly forms.
- Once you begin editing, you can't switch into or out of a multitable form and continue editing without first ending the edit session.

If the tables on the form are linked, changes to records in one table can affect the records in another table. For this reason, Paradox enforces some important restrictions on editing records on a linked multitable form. These rules protect the logical association between the master table and the linked **detail** tables.

Two rules apply only to multitable forms linked on a **one-to-one** or **one-to-many** basis. These are cases in which the master record (such as a customer record) "owns" one or more detail records (such as orders for that customer).

- You can't delete a master record in one table while linked detail records in other tables depend on it.

- Changing the value of a link key in a master table also changes the corresponding link key values in any linked detail tables.

The third rule applies to **all linked multitable forms:**

If you have begun editing in table view or on a single-table form, you won't be able to switch to a multitable form without ending the editing session first. You can't edit linked tables both on a multitable form, and in table view or on a single-table form, in the same editing session.

These rules all serve to maintain **referential integrity**, which guarantees the internal consistency of related data stored in multiple tables. They are discussed in detail in the following sections.

Deleting Master Records

You can't delete a master record in one table while linked detail records in other tables depend on it. This rule is enforced for tables linked on a *one-to-one* or *one-to-many* basis

For example, it would make little sense to have records of orders placed by a customer who doesn't exist. For this reason, Paradox won't let you delete a customer's master record while his or her orders are still visible on the detail form.

If you want to delete a master record with linked detail records in the current editing session, you must delete all the linked detail records first. (This is similar to DOS's restriction that you can't delete a directory without first deleteing all the files in it.) For similar reasons, Paradox won't allow you to add detail records associated with a master record whose link key value is blank. You must first explicitly specify the link key value of the master before entering details for it.

Changing Matching Values in Linked Tables

If you change the link key value in a master table, Paradox changes the matching detail link key values automatically. This rule is enforced for tables linked on a *one-to-one* or *one-to-many* basis.

For example, if you change a customer's ID number, you wouldn't want the customer's orders, placed with the old ID number, to get "lost" among your orders. Therefore, when you change a Cust ID value in *customer*, Paradox automatically changes the corresponding Cust values in each associated record in *bookord* to the same new value. This preserves the logical relationship between records in *customer* and *bookord*.

Because of the way tables are linked on a form, you won't see the matched field on the detail part of the form. You'll see the changed values when you switch to table view, however.

Switching Into and Out of a Multitable Form

Once you begin editing linked tables with a multitable form, the tables are **link locked**. This means that, **during the current editing session, you can edit the tables only through the multitable form.**

If you press Form Toggle [F7] to switch to table view, you'll see the master table in table view—even if the cursor was on a detail table. You won't be able to edit any of the tables, however. A status indicator will remind you that the tables are **link locked**.

Once you use a multitable form in an editing session, Paradox preserves the logical relationship between linked tables for the duration of the session. So, if you start an editing session and begin using a linked multitable form, you must use that form for the remainder of the session. This ensures that improper deletions are not allowed and that referential integrity is maintained. If you want to use table view to make changes to any table on the multitable form, you must first end the current multitable editing session and start a new session with the table itself.

For the same reasons, if you have begun data entry in table view or on a single-table form, you won't be able to switch to a multitable form without ending the data entry session first. You can't enter records in linked tables both on a multitable form, and in table view or on a single-table form, in the same data entry session.

The editing rules that Paradox applies to linked tables are enforced only when you use the multitable form. The linkage does not carry over to new sessions using table view or a single-table form.

This means that, in a new session with a single table, you can make changes that Paradox might not permit with the multitable form, such as deleting a master record on which detail records depend. Because Paradox cannot guarantee referential integrity in such cases, you may want to avoid editing the tables individually.

Undoing Changes on a Multitable Form

When you edit tables through a multitable form, you can still undo each change you've made during the session by pressing [Ctrl][U] or selecting **Undo** from the Edit menu. Paradox preserves referential integrity as you undo any changes to linked tables. Thus, if you've changed a link key value in a master table, when you undo this change, all the corresponding link key values in associated detail tables will also be undone.

When using multitable forms for editing, you will be prompted for a password for the master table if it's password protected. You will **not** be prompted for passwords for any of the detail tables. If you want to password protect any of these tables, you should assign them the same password as the master. Using this strategy, when the password is provided for the master, it will unlock all of the embedded tables on the form.

Editing on a Network

When you select **Modify/Edit** on a network, Paradox automatically places a full lock on the table. This means that others on the network cannot use that table for any reason until you are finished with your editing session. Because Edit mode requires this exclusive access to tables, if you are working with tables that others also need to use, it's almost always preferable to use the **Modify/Coedit** option, which allows multiple users to make changes to a table simultaneously.

If someone else on the network is using a table you want to edit, you won't be able to begin until he or she has finished working with it. Again, Coedit mode is usually preferable in such circumstances, since it allows you to use the table at the same time as others are working with it.

There may be restrictions on your ability to edit tables that have been created by other users. The level of access you've been granted by the owner of the table may limit the scope of changes you can make to it. There are two types of restrictions that apply to editing tables: table rights and field rights. Briefly, the restrictions on editing imposed by the different kinds of table rights are as follows:

- **ReadOnly**: You can view the table, but can't edit it.
- **Update**: You can change only non-key fields in existing records.
- **Entry**: You can enter new records and change key fields using **DataEntry** or **Tools/More/Add**, but can't delete records.
- **InsDel**: You can change and delete existing records and insert new records.
- **All**: You have complete access to the table.

The table's owner can also restrict access to specific fields of the table. The levels of field rights are:

- **None**: You won't be able to view or change the values in the field.
- **ReadOnly**: You can view the values in the field, but can't change them.
- **All**: You can both view and change the values in the field.

Paradox will give you a message if you try to start an edit operation for which you have insufficient rights. See the discussion of the **Tools/More/Protect** selection in Chapter 10 (Tools) for details.

Note that when you are working with multitable forms, you must have sufficient rights to each of the tables on the form you'll be changing. Because changing a link key in a master table automatically updates the corresponding link keys in associated detail tables, you'll need at least Entry rights to all tables involved in a linked multitable form before you can change any key values through the form.

CoEdit

Sort Edit CoEdit DataEntry MultiEntry Restructure
Edit a table with other users.

Modify/Edit is appropriate when a single user is making changes to a table. When you are in Edit mode, Paradox automatically places a full lock on the tables you are editing, thus preventing others from using them. For this reason, when two or more users want to make changes to a table simultaneously, normal Edit mode can't be used.

Modify/Coedit, on the other hand, is specifically designed to allow several users to edit a table at once. Paradox applies a prevent full lock, which allows the maximum level of concurrent use, to tables being coedited. In addition, Paradox locks each **record** that is being changed. This enables many users to work with a table at the same time; the only limitation is that two users cannot edit the same record at once.

Alt **F9** **Coedit**

To enter Coedit mode, either choose **Modify/Coedit** from the Main menu or press CoEdit [Alt][F9] when one or more tables you want to edit are on the workspace.

Working with Coedit

As in normal Edit mode, all of the images on the workspace are available for coediting. You can coedit a table in either table view or form view.

Unlike Edit mode, if you have two or more images of a single table on the workspace and the tables you're working with are in a shared directory, when you enter Coedit mode duplicate images of that table won't be removed automatically. Duplicate images will be removed if you're coediting tables in a non-shared directory.

The process of moving around the workspace, changing field values, using field view for editing, and inserting and deleting records is exactly the same in Coedit as in normal Edit mode. In addition, all of the supports and shortcuts available in normal Edit, such as automatic fill in, Zoom [Ctrl][Z], and Ditto [Ctrl][D], work in Coedit as well. See "Edit" earlier in this chapter for details. To end a coediting session, press Do-It! [F2] or select **DO-IT!** from the Coedit menu.

Although Edit and Coedit modes are similar in many ways, there are several significant differences between them. These are summarized in Table 7-1. Note to developers: some of the special features of Coedit mode, such as its high level of support for handling key violations, make it preferable to Edit mode even for single-user applications.

Table 7-1. Differences Between Edit and Coedit Modes

Operation	Edit	Coedit
Record locking	No record locking	Records being changed are locked automatically
Table locking	Full lock placed on table; only the person editing has access to the table	Prevent full lock placed on table; prevent write lock placed whenever a record is locked
Posting changes	Changes are posted to disk once at the end of the editing session	Changes are posted on a record-by-record basis
Undo	All changes made during the editing session can be undone	Only the most recent change can be undone
Key violations	If the key of a new record conflicts with that of an existing one, non-key fields of the new record automatically replace those of the old	If there is a key violation, you can choose whether to accept the new values in non-key fields or to keep the old values
Performance	Generally not as fast as coedit	Generally faster than edit
Modifying records in linked multitable forms	Permitted with certain restrictions	Permitted with certain restrictions, providing all users use the same multitable form

Record Locking

Unlike other modes, which lock only tables, in Coedit mode Paradox also locks individual records. Paradox automatically locks a record as soon as you start to make changes to it. If you merely scroll through the table without changing any data, no record locks are placed.

A status message on the second line of the screen will tell you that a record is locked. The edit mark (◄) that shows the end of the current field will also be highlighted.

When you lock a record, you have exclusive use of it until it is unlocked. No other users may make changes to the record until you are done working with it.

If you move the cursor to a record that has been locked by another user you'll get a message telling you that user's name. You will be able to view the record, but you won't be able to change or delete it until the other user has unlocked it.

Unlocking a Record

Locked records can be unlocked either automatically by Paradox or explicitly by you. As soon as a record is unlocked, any changes you've made to it are immediately posted to the table and other users can see your changes and make their own.

A locked record is automatically unlocked by either of two actions:

- Pressing Do-It! [F2] or selecting **DO-IT!** from the Coedit menu to end the coedit session, **or**
- Moving the cursor to another record in the same table. You can do this by:
  - Pressing [▲] or [▼]
  - Pressing [←] or [Shift][Tab] if the cursor is in the table's leftmost field
  - Pressing [→], [Enter], or [Tab] if the cursor is in the rightmost field.

Note that, when a record is locked, moving to another image on the workspace (with Up Image [F3] or Down Image [F4]) does not unlock the record. It is still the current record of the table you were in originally. Thus, although you can lock only one record per image, you can have several records in **different** images locked simultaneously.

If you have locked records in one or more tables, pressing Do-It! [F2] or selecting **DO-IT!** from the menu will post any changes you've made, unlock all the records, and then end your coediting session.

See "Coediting with Multitable Forms" later in this chapter for special considerations you should be aware of when using multitable forms in a coediting session.

Explicit Record Locking and Unlocking

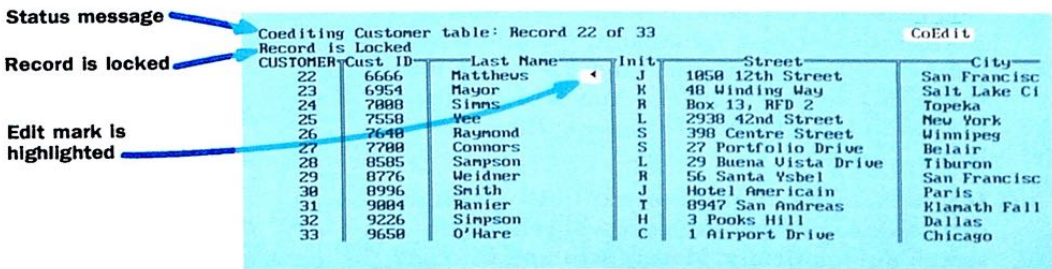
In addition to Paradox's automatic record locking, you can explicitly lock a record by pressing Lock Toggle [Alt][L]. Explicitly locking a record is useful when you want to prevent other users from changing a record before you are ready to start changing it yourself.

Pressing Lock Toggle [Alt][L] when a record is locked will unlock it and post any changes you've made. You can use Lock Toggle [Alt][L] to unlock a record whether it was automatically locked by Paradox or explicitly locked by you.

Locking Multiple Records in One Table

You can lock two or more records simultaneously in a single table by placing multiple images of the table on the workspace before you begin coediting. Note that this will not work if the table you are using is not stored in a shared directory.

Since you can lock one record per table image, if you wanted to lock up to four records in *orders* simultaneously, you would place four images of *orders* on the workspace and then press CoEdit [Alt][F9]. This technique is useful if you want to transfer information among different records in the same table, or



from several records in one table to one or more records in another.

You can also lock many records in a single table if that table is a linked detail table in a multirecord form. See "Coediting with Multitable Forms" later in this chapter for details.

Entering New Records

As in normal editing, you can enter new data into a table you are coediting by pressing [Ins] to open up a new blank record. When you press [Ins], the status message **Entering new record—not yet posted to table** will appear on the second line of the screen.

This message indicates that the new record you've inserted exists only in your image of the table. It is not available to other users until you post it by moving the cursor to another record in the table or ending your coedit session. Because of this, new records you are entering are not locked.

Refreshing the Screen

When you are coediting a table with other users, you probably will not instantaneously see the changes they make to the table. Changes are shown each time the image on your screen is **refreshed**, or repainted. Three things can cause the screen to be refreshed:

[Alt] [R] **Refresh**

- **Pressing Refresh** [Alt][R] will immediately update the images on your screen. You will see any changes that other users have made to the portions of the tables that are currently displayed.
- **An automatic refresh by Paradox** will update the images displayed on the screen. Each time Paradox automatically refreshes your screen, the images on it will be updated with the changes other users have made since the last refresh.

  Selecting **AutoRefresh** from the Coedit menu lets you adjust the autorefresh interval. This setting tells Paradox how often to automatically refresh your screen. By default, the autorefresh interval is 3 seconds; you can set it to any interval from 1 second to 1 hour. You can also disable the autorefresh feature by leaving the interval blank.
- **If you start to change or explicitly lock an out-of-date record** Paradox will refresh the screen automatically. Merely scrolling through the table or moving the cursor to a changed record will not refresh the screen. However, as soon as you begin to change an out-of-date record or press Lock Toggle [Alt][L] to try to lock it, Paradox will update the image. This prevents you from working with incorrect or inconsistent data.

The amount of screen activity you see during a coediting session depends on the number of other users making changes to tables you're working with, the number and location in the table of changes each user is making, and how often your screen is refreshed.

If other users are working in the same part of a table that you are, you may see its values being changed on your screen in "real time." If others are working above the part of the table you are working in, you may see record numbers being changed as records are added or deleted.

Undoing Changes

As explained earlier in this chapter, when you select **Modify/Edit** to make changes to a table, Paradox keeps a transaction log of each change you make in the current editing session. Even though changes are continually posted to disk, the transaction log allows you to undo all or part of your changes or new entries at any time until you end the session.

In Coedit mode, you undo changes just as you do in Edit mode—by selecting **Undo** from the Coedit menu or by pressing Undo [Ctrl][U]. However, due to the complexity of undoing changes when several people are editing a table simultaneously, you can only undo the last change you have made.

There are a few cases in which you may not even be able to undo your last change. For example, suppose you are coediting *orders* and you've made a change to a record. Then, immediately after your change is posted, another user who is also coediting *orders* deletes the same record. If you then try to undo your change, you won't be successful because the record no longer exists. (Of course, if **you** delete a record, you can recover it with Undo—but only if you've not changed another record since the deletion).

Coediting Keyed Tables

When you are coediting a keyed table, there are two special conditions to be aware of:

- posting new records to remote sections of the table
- handling key violations.

Posting New Records

When you finish entering or making changes to a record in Coedit mode, or when you press Lock Toggle [Alt][L] to explicitly unlock a record, it is immediately posted to the table. Since keyed tables are kept in sorted order according to the values in their key fields, posting the record requires moving it to its proper place in the table according to its key.

If you enter a record with a key value that belongs in another part of the table, it will seem to "fly away" from its previous position when you post it (see Example 7-2). In fact, depending on where it belongs in the table, it may disappear from your screen altogether. A message will tell you the record number to which the new record has been posted. The cursor won't move, however; it remains in the same row of the current image.

Key Violations

When you are coediting a keyed table, Paradox provides special support for handling key violations. If you enter a new record whose key duplicates one that already exists, or change the key value of an existing record to that of another, a message will inform you of the key violation when you try to post the record. Paradox will not let you continue until the violation is resolved.

At this point you have four choices:

- **If the key value you've just entered is incorrect**, go back and change it to the correct value and continue by posting the record.

[Ctrl][U] **Undo**

- **If the entire record you've just entered or altered is incorrect**, press Undo [Ctrl][U] or select

7-2. Entering a New Record in a Keyed Table

Suppose you are coediting the *customer* table, which is keyed. You begin entering a new record for F. Thompson by opening a new blank record at the top of the table.

Thompson's record is entered at the top of the table. When you press [↓] to post the record, it is placed in correct sorted order according to its key value. Because the part of the table the record is posted to is not currently displayed, it seems that the record "flies away" from the table image on the screen.

Values inserted into new blank record

Coediting Customer table: Record 1 Of 34 — CoEdit
Entering new record - not yet posted to table

CUSTOMER	Cust ID	Last Name	Init	Street	City
1	7810	Thompson	F	2339 Broadway	San Francisc
2	1386	Aberdeen	F	45 Utah Street	Washington
3	1388	Svenvald	I	Gouvernment House	Reykjavik
4	1784	McDougal	L	4950 Pullman Ave NE	Seattle
5	2177	Bonnefenne	S	128 University Drive	Stanford
6	2579	Chavez	L	Cypress Drive	Palm Springs
7	2779	Fahd	S	The Palace	Riyadh
8	3128	Elspeth, III	R	1 Hanover Square	London
9	3266	Hanover	A	15 State Street	Dallas
10	3271	Massey	C	29 Aragona Drive	Oxon Hill
11	3771	Montaigne	L	30 Tauton Drive	Bellevue
12	4277	Matthews	R	P. O. Box 20336	Albuquerque

Press [↓] to post record in correct sorted order

Coediting Customer table: Record 1 of 35 — CoEdit

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
1	1386	Aberdeen	F	45 Utah Street	Washington	DC	20032	USA	50,000.00
2	1388	Svenvald	I	Gouvernment House	Reykjavik			Iceland	1,250,000.00
3	1784	McDougal	L	4950 Pullman Ave NE	Seattle	WA	98105	USA	150,000.00
4	2177	Bonnefenne	S	128 University Drive	Stanford	CA	94323	USA	75,000.00
5	2579	Chavez	L	Cypress Drive	Palm Springs	FL	32938	USA	250,000.00
6	2779	Fahd	S	The Palace	Riyadh			Saudi Arabia	5,000,000.00
7	3128	Elspeth, III	R	1 Hanover Square	London			England	1,000,000.00
8	3266	Hanover	A	15 State Street	Dallas	TX	75043	USA	750,000.00
9	3271	Massey	C	29 Aragona Drive	Oxon Hill	MD	29902	USA	1,000,000.00
10	3771	Montaigne	L	30 Tauton Drive	Bellevue	WA	98004	USA	450,000.00
11	4277	Matthews	R	P. O. Box 20336	Albuquerque	NM	87234	USA	50,000.00
12	4335	Farouk	K	Hotel Cairo	Cairo			Egypt	250,000.00
13	4480	Samuelson	F	Bull Run Ranch	Aurora	CO	89022	USA	600,000.00
14	4485	Fischer	R	14 Willow Lane	Birminghan	MI	48011	USA	1,000,000.00
15	4589	Leonardo	D	198 Via Canales	Rome			Italy	1,500,000.00
16	4700	Harris	J	Old Country Road	Atherton	CA	94322	USA	750,000.00
17	4804	Anders	B	Jaktstigen 42	Lidingo			Sweden	300,000.00
18	5341	Chevalier	R	392 Boulevard Raspil	Montpelier			France	1,750,000.00
19	5720	Helms	D	52 Brattle Street	Cambridge	MA	02138	USA	85,000.00
20	5855	Chin	F	Hotel Orient	Jurong			Singapore	150,000.00
21	6125	Haves-Anderson	D	Waves Cottage	Palm Springs	FL	32382	USA	600,000.00
22	6666	Matthews	J	1050 12th Street	San Francisco	CA	94232	USA	1,250,000.00
23	6954	Mayor	K	48 Winding Way	Salt Lake City	UT	84108	USA	100,000.00
24	7000	Simms	R	Box 13, RFD 2	Topeka	KS	66104	USA	1,500,000.00
25	7550	Yee	L	2938 42nd Street	New York	NY	10032	USA	1,500,000.00
26	7640	Raymond	S	398 Centre Street	Winnipeg	ON		Canada	500,000.00
27	7700	Connors	S	27 Portfolio Drive	Belair	CA	98026	USA	900,000.00
28	7810	Thompson	F	2339 Broadway	San Francisco	CA	94123	USA	1,000,000.00
29	8585	Sampson	L	29 Buena Vista Drive	Tiburon	CA	97992	USA	150,000.00

Undo from the menu to undo your changes. If you've been entering a new record, it will disappear; if you've been changing an existing record, its original values will be restored. In either case, the key violation will be resolved.

Alt **L** **Lock Toggle**

- **If the values you've just entered are correct**, and you want to use them to update values in the existing record, press Lock Toggle [Alt][L]. Paradox will substitute the non-key values in the current (new) record for those in the existing record with the same key. The current record will be removed from the table and the existing record will be updated in place.

  If you've changed the key fields of an existing record so that they duplicate the key of another record, the original key value of the first record will be lost when you press Lock Toggle [Alt][L]. You can use Undo [Ctrl][U] to reverse the change.

Alt **K** **Key Viol**

- **If you're not sure which values are correct**, press KeyViol [Alt][K] to view the values in the records that have conflicting keys. KeyViol [Alt][K] is a toggle that alternately shows you the existing and the new non-key values in the two records. It is especially useful when the record with the conflicting key is in a remote part of the table.

  When you have determined which of the two records is correct, press Lock Toggle [Alt][L] to update the existing record with the new values or Undo [Ctrl][U] to undo changes and retain the existing values.

The Coedit Menu

Image Undo AutoRefresh Help DO-IT!
Resize or reformat an image; move to a field, record, or value; pick a form.

While you are coediting, you can press Menu [F10] at any time to display the Coedit menu. It contains four choices:

Image: To rearrange information on the screen

Undo: To undo the most recent change to the current image

AutoRefresh: To set the rate at which your screen is refreshed

Help: To obtain help about coediting

- **DO-IT!**: To end the coediting session, unlock any records that you've locked, post changes you've made to those records, and return to the main workspace.

Image

Image Undo AutoRefresh Help DO-IT!
Resize or reformat an image; move to a field, record, or value; pick a form.

The **Image** selection on the Coedit menu is the same as the **Image** selection on the Main menu. During coediting, **Image** lets you:

- resize an image on the screen
- format, resize, or rearrange the fields in the image
- select a form to display
- move to a field, record or value.

You can also use Zoom [Ctrl][Z] and Zoom Next [Alt][Z] as a shortcut for **Image/Zoom/Value** to quickly locate specific records in tables you're coediting. For details, see Chapter 8 (Image) of this manual.

Undo

Image Undo AutoRefresh Help DO-IT!
Undo the last change made to the current image.

The **Undo** selection lets you undo the last change you've made to the current image. In a coediting session, you can only undo the most recent change you've made to an image. For details see "Undoing Changes" earlier in this section.

Because Paradox does not keep a transaction log during a coediting session, you cannot Cancel all of your changes (return to the original state of the table before the session began). There is therefore no Cancel selection on the Coedit menu.

AutoRefresh

Image Undo AutoRefresh Help DO-IT!
Change the autorefresh interval.

The **AutoRefresh** selection lets you specify how frequently Paradox will update the images displayed on your screen. This selection duplicates the **Tools/Net/AutoRefresh** selection of the Paradox Main menu.

You can set the autorefresh interval to any period between 1 second and 1 hour (3600 seconds). The default is 3 seconds. Paradox will check at the currently-set interval to determine whether any records in the images on your screen have been changed by another user. If there are changes, Paradox will automatically update the images you

are viewing. When it does this, you'll see a **Refreshing...** message on the bottom of your screen.

When you select **AutoRefresh** from the Coedit menu, Paradox will display the currently-set refresh interval in the menu:

```
Interval: 3
Enter new autorefresh interval or leave blank to disable.
```

To change the interval, backspace over the current value and type in the new value you want to set. The interval is expressed in seconds and can be from 1 to 3600. Leaving the interval blank will disable the autorefresh feature.

Validity Checks

There is no **ValCheck** selection on the Coedit menu. Though you can't define new validity checks or clear existing ones while you are coediting, any validity checks that have already been established for the tables you are coediting will be applied.

If you want to define or change validity checks, you can do so during a normal edit or a data entry session.

Restrictions on Accessing Tables

There may be restrictions on your ability to coedit tables that have been created by other users. The level of access you've been granted by the owner of the table may limit the scope of changes you can make to it. See "Editing on a Network" earlier in this chapter for details.

Coediting with Multitable Forms

As in Edit mode, you can use multitable forms to coedit records in more than one table at a time. When coediting linked tables, the same editing restrictions are enforced to preserve the internal consistency of your data:

- You can't delete a master record while detail records depend on it.
- Changing the value in a linked master field also changes the corresponding values in any linked detail fields.

  Notice that this rule is somewhat less restrictive than in Edit mode. After posting one or more records in Coedit mode, you can switch into a multitable form and continue coediting, but not back out again.

For details on these rules and on linked multitable forms in general, see "Editing Records in Multitable Forms" earlier in this chapter.

In Coedit mode, an additional rule applies:

- While any one user is coediting on a linked multitable form, other users who want to coedit any of the tables on it must do so through the same form.

  This rule also protects the internal consistency of the data. The tables may be viewed in table view or through other forms, just not coedited.

When you are coediting through a multitable form, moving the cursor away from the current image will cause Paradox to post any changes you've made. For example, suppose you're editing the master *customer* table through a multitable form, and you've just changed a customer's phone number. Moving the cursor to the associate detail *orders* table will post the change to *customer*. If you change the value of a key field, in a master record, when you move the cursor to the detail images the change will be posted, and the record will be placed in the correct order in the table. However, that master record will be maintained as the current master and it will remain locked, allowing you to continue working on associated details for that master.

There may be times when Paradox asks you to explicitly post your changes to a record before it can execute an action you've specified. For example, if you're coediting through a multitable form, and you want to toggle to table view, Paradox will ask you to post the last change you've made before it can complete the toggle.

Note that when you lock a master record, all of the associated detail records are automatically locked. Similarly, when you lock a detail, the corresponding master (and therefore, the remainder of the details) is locked as well. This makes it easy to lock an arbitrary number of related records in a single table.

Because of the requirement that all linked details must be locked whenever a master record is locked and vice versa, you must have access to all associated records in all tables in a multitable form before any may be locked. If another user on the network has any one of the associated records locked, you will not be able to apply a record lock either to the master or its linked details until the other user releases his or her lock.

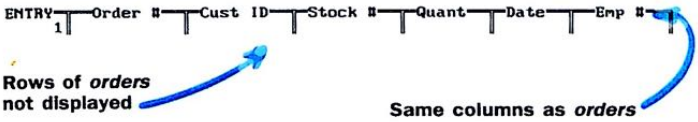
When using multitable forms for coediting, you will be prompted for a password for the master table if it's password protected. You will **not** be prompted for passwords for any of the detail tables. If you want to password protect any of these tables, you should assign them the same password as the master. Using this strategy, when the password is provided for the master, it will unlock all of the embedded tables on the form.

DataEntry

Sort Edit Coedit DataEntry MultiEntry Restructure
Add a batch of new records to a table.

Although you can use the **Modify/Edit** or **Modify/Coedit** option to add records to a table, when adding more than a few records it's preferable to use the **Modify/DataEntry** option. With this method, the existing records are not displayed on the screen, so you can't accidently remove or change them.

The *Entry* Table



When you select **DataEntry** and enter a table name, you will see an empty table called *entry*. It will have the same structure as the table you chose.

You can begin entering records immediately, moving around, typing, and editing the *entry* table just as you would any other Paradox table. (The keys and conventions are described under "The Keyboard" in Chapter 2 of this manual, and in the "Edit" section in this chapter). You may also press Form Toggle [F7] and enter the new records on the standard form, or create a custom form for data entry. Again, all editing conventions are the same.

When you are finished entering data, press Do-It! [F2]. Paradox will merge the records from *entry* with the existing records in the table you specified. The records will be added at the end of the table unless it is keyed, in which case they will be merged into the table in key field order.

If any of the new records has a key value that duplicates the key of an existing record (thus violating the requirement that key values be unique), the new record will placed in a temporary Paradox table called *keyviol*. You can edit such records to remove the key violation and then use **Tools/More/Add** to add them to the original table. Remember that *keyviol* will be overwritten the next time key violations are found and erased when you exit from Paradox.

When you add records to Paradox tables, the entries are not final until you press Do-It! [F2] or select **DO-IT!** from the menu. During a data entry session, you will see your disk drive light come on as Paradox's autosave feature stores the information on the disk. This minimizes the chance of losing valuable data.

Between disk saves, the new records are kept in your computer's memory where it is vulnerable to power failures and other errors. If you want to further reduce the chance of data loss, press Do-It! [F2] periodically to save your new records on the disk.

The DataEntry Menu

Image Undo ValCheck KeepEntry Help DO-IT! Cancel
Resize or reformat an image; move to a field, record, or value; pick a form.

While you are entering records, you can display the DataEntry menu by pressing Menu [F10] at any time. It contains these choices:

- **Image**: To rearrange information on the screen
- **Undo**: To undo the last change made to the *entry* table
- **ValCheck**: To set requirements for entries in a field and to lookup or fill in values from other tables
- **KeepEntry**: To terminate data entry, maintain the records in the *entry* table, and return to the main workspace
- **Help**: To obtain help about data entry
- **DO-IT!**: To complete data entry, add the records to the table, and return to the main workspace
- **Cancel**: To terminate data entry, eliminate the new records, and return to the main workspace.

Image

Image Undo ValCheck KeepEntry Help DO-IT! Cancel
Resize or reformat an image; move to a field, record, or value; pick a form.

The **Image** selection on the DataEntry menu is the same as the **Image** selection on the Main menu. It lets you

- resize an image on the screen
- format, resize, or rearrange the fields in the image
- select a form to display
- move to a named field, record, or value

while adding new records. For details, see Chapter 8 (Image) of this manual.

ValCheck

Image Undo ValCheck KeepEntry Help DO-IT! Cancel
Define or clear validity checks for the current table.

The **ValCheck** selection on the DataEntry menu is the same as the **ValCheck** selection on the Edit menu. It lets you set or clear requirements and

default values for the entries in a field. For details, see the "Edit" section earlier in this chapter.

KeepEntry

Image Undo ValCheck KeepEntry Help DO-IT! Cancel
Complete data entry, keep Entry table without adding records to target table.

The **KeepEntry** selection on the DataEntry menu lets you save the *entry* table without merging it into the target table you specified. **KeepEntry** is particularly useful when you can't complete a data entry operation on a network because the target table has been locked by another user (see "DataEntry on a Network" later in this section for details).

If this happens, when you press Do-it! [F2] or select **DO-IT!** from the menu, you'll get a message that the target table is locked. At this point you have three options:

- Select **KeepEntry** to save the *entry* table. You should then use the **Tools/Rename** selection to rename *entry* so that it will not be deleted or overwritten. At a later time, you can use the **Tools/More/Add** selection of the Main menu to merge the records from the renamed *entry* table into the target.
- Select **Cancel** from the DataEntry menu to terminate the data entry session.
- Wait awhile to give the user who has locked the table a chance to finish working with the table.

Then try to complete your data entry by pressing Do-It! [F2] or selecting **DO-IT!** from the menu.

DataEntry with Multitable Forms

As discussed under "Edit" earlier in this chapter, you can design and edit data on forms that show more than one table. A multitable form is always based on a *master* table—the one for which the form was designed. Forms for other tables are **embedded** on the master form. The master and embedded forms may be linked (logically associated) or unlinked. See Chapter 2 (Designing Forms) of *Presenting Paradox Data* for complete details on designing multitable forms.

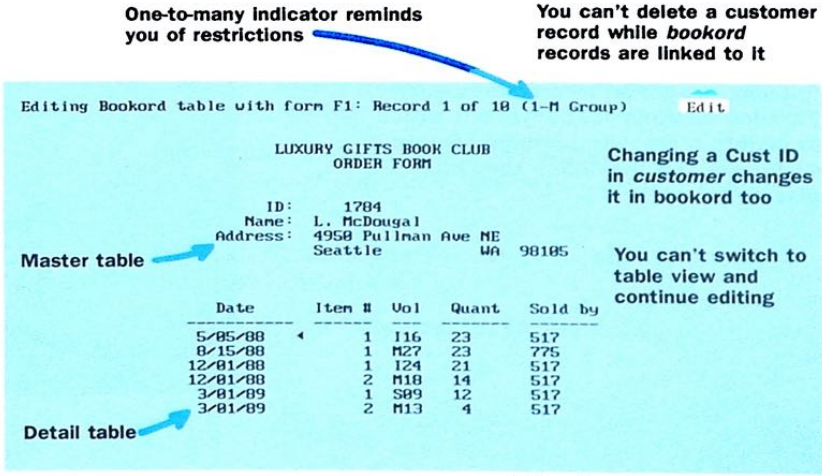
You can enter new records into tables on a multitable form, just as you can use forms to enter records into single tables. To do so, select **Modify/DataEntry** and specify the table name. When the *entry* table appears, select **Image/PickForm** from the DataEntry menu and choose the multitable form.

You can use Up Image [F3] and Down Image [F4] to move from one image on the form to another. Once on a particular image, you can move around, enter and change field values, insert and delete records, and undo changes just as described at the beginning of the section on Edit.

If the tables on the form are linked, however, there are some restrictions on entering and changing records. The rules are essentially the same as when editing on a multitable form, so see "Editing Records in Multitable Forms" earlier in this chapter for

7-3. Editing Restrictions in Linked Forms

Suppose you are editing book orders on a multitable form in which the master *customer* table is linked to the detail *bookord* table. This is a one-to-many link in which the records in *bookord* rely for their full significance on records in *customer*. Paradox restricts your edits in order to maintain the relationships between customers and the orders they have placed.



details. Differences are discussed in the following sections.

- You can't delete a master record while detail records depend on it.
- Entering or changing a value in a master field also enters or changes matching values in any linked detail fields. You can't enter detail records on a multitable form while the link key in the master is blank.
- Once you begin data entry, you can't switch into or out of a multitable form and continue without first ending the data entry session.

Deleting Master Records While Entering Data

You can't delete a master record if any linked detail records depend on it. This rule is enforced for tables linked on a *one-to-one* or *one-to-many* basis.

You'll see this restriction if you enter a new master record on a multitable form, then enter some linked detail records, and finally return to the master record and try to delete it. If you want to delete a master record with linked detail records in the current data entry session, you must delete all the linked detail records first.

Entering Values in Linked Fields

If you enter a value in a link key of a master record, Paradox enters the corresponding detail link key value automatically. If you later change the master link key value, Paradox changes the corresponding detail values. This rule is enforced for tables linked on a *one-to-one* or *one-to-many* basis.

For example, suppose you enter a new *customer* record. When you move down to enter book orders, they will "inherit" the Cust ID from the *customer* record. Even though the *bookord* Cust number does not appear on the form, you'll see the matching values when you later view the *customer* and *bookord* tables. So that Paradox will know how to associate a master record with its corresponding detail records, you won't be able to enter any details until you specify the value of the link key in the master.

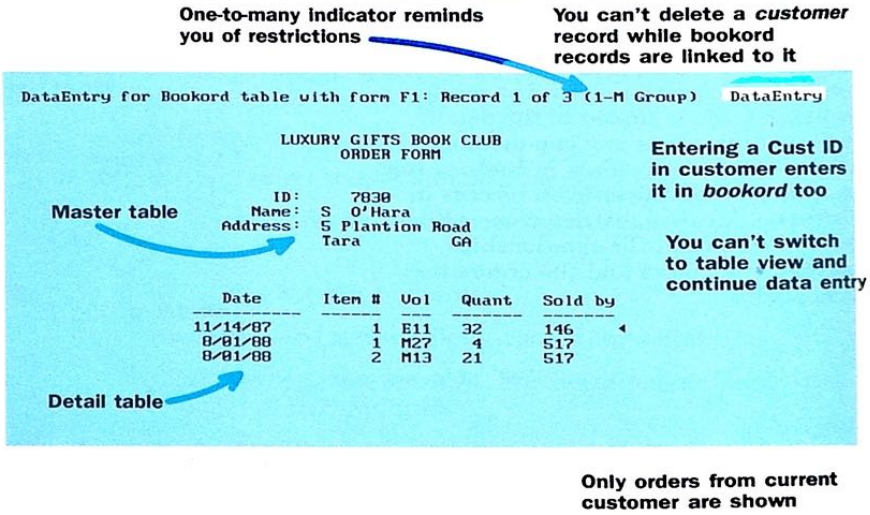
Switching Into and Out of a Multitable Form

Once you begin entering records in linked tables with a multitable form, the tables are **link locked**. This means that, **during the current data entry session, you can enter data only on the multitable form.**

If you press Form Toggle [F7] to switch to table view, you'll see the master table in table view—even if the cursor was on a detail table. You won't be able to enter data in any of the tables, however. A status

7-4. Data Entry Restrictions in Linked Forms

Suppose you are entering new book orders on a multitable form in which the master *customer* table is linked to the detail *bookord* table. The link means that the records in *bookord* rely for their full significance on records in *customer*. Paradox restricts your entries in order to maintain the relationships between customers and the orders they have placed.



indicator will remind you that the tables are **link locked**.

So, if you start a data entry session and begin using a linked multitable form, you must use that form for the remainder of the session. If you want to use table view to enter records in any table on the multitable form, you must first end the current multitable data entry session and start a new session with the table itself.

Key Violations with Multitable Forms

If any of the new records have key values that duplicate the keys of existing records, Paradox will place the new records in a series of temporary tables called *keyviol*, *keyviol1*, *keyviol2*, and so on. You'll see a *list* table that relates each *keyviol* table to the base table for which the record was intended.

You can edit these *keyviol* tables individually to remove the key violations, and then use **Tools/More/FormAdd** to merge the records into the target tables. **FormAdd**, as described in Chapter 10 (Tools), maintains the integrity of linked tables on the form.

Remember that the *keyviol* tables will be overwritten the next time multitable key violations are found, and erased when you exit from Paradox. If you can't resolve the violations immediately, you may want to rename the *keyviol* tables.

KeepEntry with Multitable Forms

If you can't complete a data entry operation because one or more of the tables on the form are locked by another, select **KeepEntry** from the DataEntry menu. When **KeepEntry** is used with a multitable form, Paradox saves the new records for each table in a series of temporary tables called *entry*, *entry1*, *entry2*, and so on. You'll see a *list* table that relates each *entry* table to the base table for which the record was intended.

First, use **Tools/Rename** to rename these *entry* tables so they will not be deleted or overwritten. Later, when the tables are available, use **Tools/More/FormAdd** to merge the records from the renamed *entry* tables into the target tables. As described in Chapter 10 (Tools), **FormAdd** maintains the referential integrity of linked tables on the form.

DataEntry on a Network

When you select **Modify/DataEntry** on a network, Paradox automatically places a prevent full lock on the table or tables to which the records will be added. This means that other users have access to the tables for all operations except those that require their exclusive use (such as restructuring or emptying). If someone else on the network has started an operation that requires a full lock on a table, you won't be able to begin entering data for the table until that user has finished working with it.

The *entry* tables you use to actually enter the data do not need to be locked. This is because they are Paradox temporary tables, and are therefore stored in your private directory.

When you press Do-It! [F2] or select **DO-IT!** from the menu, to indicate that you're ready to add the records from the *entry* tables into the target table, Paradox automatically places a prevent write lock on the targets. If another user has started an operation that placed a write lock on a table, you will not be able to complete your data entry until that user has finished the operation. In such cases, you can use the **KeepEntry** selection on the DataEntry menu to save the *entry* tables without merging them into the target tables. As just explained, if you're using a multitable form for your data entry session, you'll need to use **Tools/More/FormAdd** to merge the data from the separate saved *entry* tables into their corresponding tables to ensure that referential integrity is maintained.

There may be restrictions on your ability to enter data into tables that have been created by other users. The level of access you've been granted by the owner of the table may limit the scope of changes you can make to it. There are two types of restrictions that apply to data entry: table rights and field rights. Briefly, the restrictions on data entry imposed by the different kinds of table rights are as follows:

- **ReadOnly**: You can't enter data into the table.
- **Update**: You can enter data into only non-key fields in existing records.
- **Entry, InsDel, All**: You can enter new records into the table.

The table's owner can also restrict access to specific fields of the table. The levels of field rights are:

- **None, ReadOnly**: You won't be able to enter values in the field.
- **All**: You can enter values in the field.

MultiEntry

Sort Edit Coedit DataEntry **MultiEntry** Restructure
Add a batch of records to two or more tables simultaneously.

The **Modify/MultiEntry** selection enables you to use a single table as a data entry form, but have the records added to two or more tables at once. This feature allows you the convenience of using a single data entry table or form when you are adding new records. The **Tools/More/MultiAdd** selection provides a similar capability when you want to use a single table to update records in more than one table at a time.

If the tables fit the required structure, another way to add records to two or more tables at once is to use DataEntry with a multitable form. For details, see "DataEntry with Multitable Forms" in the previous section, and "Designing Multitable Forms" in Chapter 2 (Designing Forms) of *Presenting Paradox Data*.

Before you can use **Modify/MultiEntry**, you must have three components in place:

- a single **source table** that you will use to enter all of the information
- two or more **target tables** into which the data entered in the source table will be transferred
- a predefined **map** that tells Paradox which fields in the target tables correspond to the fields in the source table.

In order to use the **Modify/MultiEntry** and the **Tools/More/MultiAdd** options, you first must have created a special **map** table that tells Paradox how to transfer data from a single source table to two or more target tables. You can use the **Modify/Multi-Entry/SetUp** option described later in this section to create a map from a query statement on the workspace. You can also define the map yourself by creating a new Paradox table with the proper structure and filling it out with the mapping information. Maps are described in more detail in the section on **MultiEntry/SetUp**.

7-5. Entering Data in Two Tables from One Entry Form

Suppose you wanted to enter orders that come in by telephone.

A single source table (data entry form)

NEWORD	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Order #	Stock #	Quant	Date	Emp #
1	4922	Fudd	P	Rockefeller Ctr	New York	NY	10020		1331	890	1	2/23/88	422
2	6747	Betenoir	C	4 Rue Pasteur	Levallois			France	8480	422	5	2/15/87	775

ORDMAP	Source Field	Target Field	Target Table
1	Cust ID	Cust ID	customer
2	Last Name	Last Name	customer
3	Init	Init	customer
4	Street	Street	customer
5	City	City	customer
6	State	State	customer
7	Zip	Zip	customer
8	Country	Country	customer
9	Order #	Order #	orders
10	Cust ID	Cust ID	orders
11	Stock #	Stock #	orders
12	Quant	Quant	orders
13	Date	Date	orders
14	Emp #	Emp #	orders

Uses a predefined map

To save data in two target tables

ORDERS	Order #	Cust ID	Stock #	Quant	Date	Emp #
1	1331	4922	890	1	12/23/88	422
2	8480	6747	422	5	2/15/87	775

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
1	4922	Fudd	P	Rockefeller Ctr	New York	NY	10020		
2	6747	Betenoir	C	4 Rue Pasteur	Levallois			France	

There are two relevant tables you would use to store information about the new orders—*customer*, to record each customer's name and address, and *orders*, to record the stock number and quantity of the products being ordered.

Using multitable data entry, you can create a single unified data entry form and have Paradox automatically transfer the information to as many separate tables as necessary.

The MultiEntry Menu

Entry SetUp
Use the Entry table to add records to two or more target tables.

When you select **Modify/MultiEntry** you will see a submenu with two selections:

- **Entry**: To enter data into a single source table and transfer it to two or more target tables
- **SetUp**: to use query forms to create a multitable source table and map from two or more predefined target tables.

Entry

Entry SetUp
Use the Entry table to add records to two or more target tables.

When you select **Entry** from the Modify/MultiEntry menu, you will be asked to provide the name of the single source table you want to enter data into.

Source table:
Enter name of source table or press ↵ for a list of tables.

Type in the name of the source table or press [Enter] to select the source table from a menu as described under "Paradox Menus and Prompts" in Chapter 2 (Fundamentals) of this manual. Note that the table you select must have a corresponding predefined map in order to be used as a source table for multitable data entry.

You will next be asked to provide the name of the map you want to use.

Map table:
Enter name of map table , or press ↵ for a list of tables.

Type in the name of the map table you want to use or press [Enter] to select the source table from a menu of tables. The map you select must have been defined for the source table you have previously specified. If the table you select does not have the right structure to serve as a map or if the map you have chosen has not been defined for the selected source table, you will get an error message.

Once you have specified a source table and a map, you will get an empty *entry* table that will have the same structure as the source table you selected. You can begin entering records into the *entry* table immediately, just as you would when editing any other Paradox table. You may also press Form Toggle [F7] to enter the new records on the standard form, or you can create a custom form for data entry. (Note that you can't use **MultiEntry** in conjunction with multitable forms.)

When you have finished entering data, press DoIt! [F2]. Paradox will take the data from *entry* and, using the map you have specified, merge the records into the target tables named by the map. Note that, unlike regular single table data entry, the records will **not** be merged with any existing records in the source table itself.

To use the **MultiEntry/Entry** option correctly, it is important to understand the rules Paradox follows when it is adding records from the source to the target tables. These differ somewhat from the rules followed in single table data entry.

First, Paradox uses the map to divide the records from the *entry* table into separate records for each of the specified target tables. If any of the target tables is keyed, Paradox checks for key violations and duplicate records. Then, if no key violations are found in a record, the appropriate portions of the original record will be merged into the target table in key field order. If a target table is not keyed, the new record will be added at the end of the table.

MultiEntry Key Violations.

In **MultiEntry/Entry**, a key violation occurs if any of the new records has a key value that is the same as the key value in an existing record, but the remaining non-key fields are **not** the same. That is, a key violation occurs if the keys are the same, but the rest of the record is different.

If there is a key violation for any of the target tables, the entire source record is placed in the temporary *keyviol* table. No portion of the record will be added to any of the target tables. You can edit the records in *keyviol* to remove the key violations and then use **Tools/More/MultiAdd** to add the records to the target tables. Remember that the *keyviol* table will be overwritten the next time key violations are found and will be erased when you exit from Paradox.

Duplicate Records

If the values in a record extracted from the source *entry* table exactly duplicate the values in an existing keyed target table record (that is, if there is a duplicate **record**, not just a duplicate key), the new record from the source will be "absorbed" by the existing target record—that is, it will neither be added nor be placed in the *keyviol* table. This rule allows you to use **MultiEntry/Entry** when the records in your target tables have one-to-many relationships without producing unwanted key violations. Note: it's almost always preferable to use multitable forms when the data you are entering into two or more tables have a *one-to-many* relationship.

Password Protection

When using **MultiEntry**, you will be prompted for a password for the source table, if it's password protected. You will **not** be prompted for passwords

for the map table or any of the target tables. If you want to password protect any of these tables, you should assign them the same password as the source table. Using this strategy, when the password is provided for the source table, it will unlock all of the related tables needed for the **MultiEntry** operation.

The Entry Menu

Image Undo ValCheck KeepEntry Help DO-IT! Cancel
Resize or reformat an image; move to a field, record, or value; pick a form.

When you select **MultiEntry/Entry** you will be in DataEntry mode. If you press Menu [F10] you will see the selections on the DataEntry menu. For details see "DataEntry" earlier in this chapter.

SetUp

Entry SetUp
Use the query on the workspace to create a multitable source table and map.

If you have already created a set of related target tables into which you want to do multitable operations, you can use the **MultiEntry/SetUp** option to easily define a source table and a map for both **Modify/MultiEntry/Entry** and **Tools/More/MultiAdd**. The **SetUp** selection uses a query statement to create a source table and the map that defines the relationships between the target tables and the source.

To use **SetUp**, all you need to do is place a query form on the workspace for each of the target tables you want to use in a particular multitable operation.

There are two pieces of information used to transform the query statement to a source table and map.

- Each checkmarked field in a target table becomes a field in the new source table.
- Fields in the query forms that are linked by example elements receive data from a single field in the source.

If you are not sure about how to use Paradox query forms, see Chapter 4 (Ask).

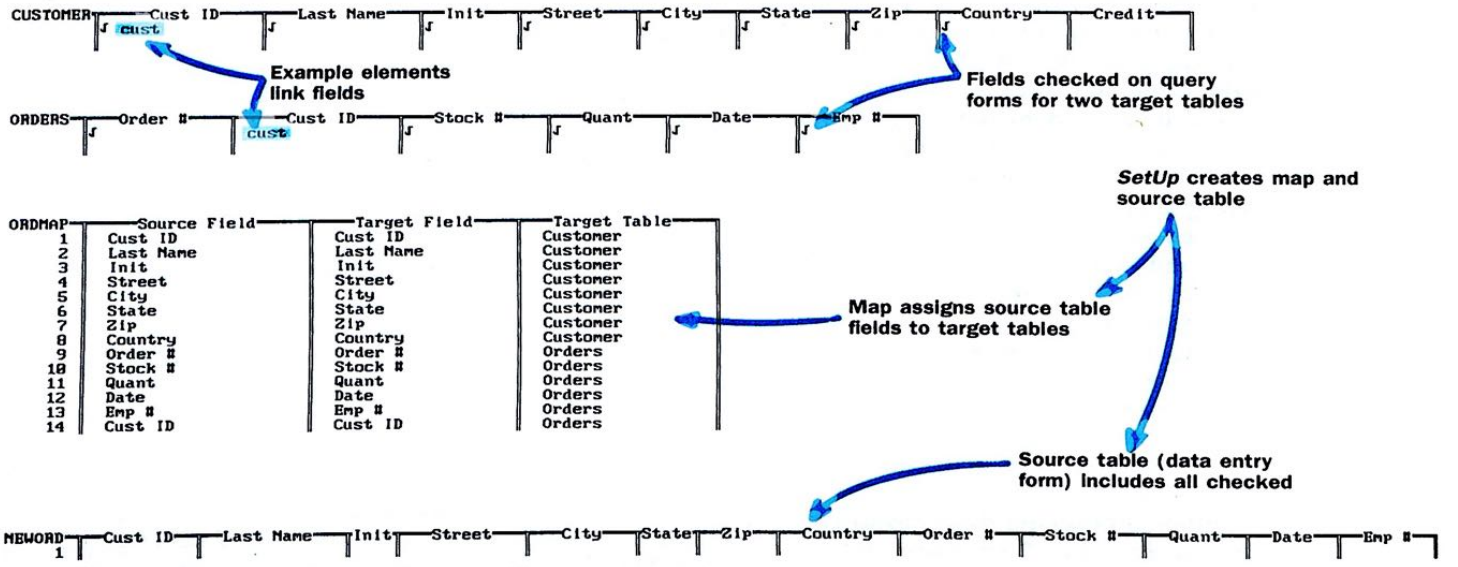
Example 7-6 shows how a query statement linking *orders* and *customer* is transformed into a new source table called *neword* and a map table called *ordmap*.

Source Tables and Maps

The source table you will get has the same structure and relationships to the target tables as the *answer* table that would be created if you performed the query on the workspace that you used with **MultiEntry/SetUp**. You can check this by just pressing Do-It! [F2] and actually performing the query.

A map is just a Paradox table with a particular structure: a table with three alphanumeric fields. The first field contains the name of the source fields that will be providing the information. The second and third columns respectively contain the name of the target field and table into which the data from the named source field will be placed. While it is much easier to create a map by using **MultiEntry/SetUp**, you could design one yourself by creat-

7-6. Creating a Map and Entry Form



ing a table with the proper structure and filling it in with the names of the source fields, target fields, and target tables you wanted to map.

Using MultiEntry/Setup

When you select **MultiEntry/SetUp** from the menu, make sure you have the appropriate query statement on the workspace. Paradox will ask for the name you want to assign to the new source table.

```
Source table:
Enter new name for source table.
```

Type the name for the new source table and press [Enter]. Paradox will then ask for the name you want to give the new map.

```
Map table:
Enter new name for map table.
```

Type the name for the new map and press [Enter]. Paradox will use the query statement on the workspace to create the source table and map and return you to the main workspace. You can then select **Modify/MultiEntry/Entry** or **Tools/More/MultiAdd** and immediately begin to do multitable operations.

There are a few rules you must follow when preparing query forms for use by **MultiEntry/SetUp**.

- The query forms used to create a multitable source table and map can only contain checkmarks and example elements; that is, they cannot contain selection criteria or arithmetic or *calc* operators.
- Each group of two or more fields in different query forms linked together by example elements must be checked once and only once.
- Each example element can be used only once per query form; that is, they can only be used to link corresponding fields in different query forms.
- The query forms cannot contain the special *insert*, *delete*, *changeto*, *set* or *find* operators.
- The query form cannot contain any inclusion operators (!).

If there are any problems in using the query statement present on the workspace to create a source table and map, you will see an error message in the message window.

More on Maps

Each field from the source table can be named as many times as necessary in a map, but each field in a target table may be named only once. When you tell Paradox the names of the source table and the map you are interested in using, it first checks to see that all of the fields named in the first column of the map correspond to fields in the specified source table. It then checks to see if the named target tables exist and that the target fields specified in the second column of the map correspond to fields in the target tables. If there are any inconsistencies, you will see an error message in the message window.

Because a map is just a regular Paradox table, you can define as many maps as you need. However, it is important to note that maps are not part of the family of any other table or tables. Therefore, if you change the structure of a table mentioned in a map, the map will not be automatically updated to reflect the change. You can, however, edit the map to reflect such changes, or use **MultiEntry/SetUp** to redefine the map.

MultiEntry on a Network

When you select **Modify/MultiEntry** on a network, Paradox automatically places a write lock on the source and map tables you specify. This means that other users have access to these tables for all operations except those that require modifying their contents or structure. If someone else on the network has started an operation that has placed a full lock or a prevent write lock on either the map or source, you won't be able to begin your multientry operation until that user has finished.

The *entry* table you use to actually enter the data does not need to be locked. This is because it is a Paradox temporary table and is therefore stored in your private directory.

When you press Do-It! [F2] or select **DO-IT!** from the menu to merge the records from *entry* into the target tables specified in the map, Paradox automatically places a prevent write lock on all target tables. If another user has started an operation that places a full or write lock on the table, you will not be able to complete the multientry until that user has finished the operation. In such cases, you can use the **KeepEntry** selection on the DataEntry menu to save the *entry* table without merging it into the target tables.

There may be restrictions on your ability to enter data into target tables that have been created by other users. The level of access you've been granted by the owner of the table may limit the scope of changes you can make to it. There are two types of restrictions that apply to data entry: table rights and field rights. Briefly, the restrictions on data entry imposed by the different kinds of table rights are as follows:

- **ReadOnly**: You can't enter data into the table.

- **Update**: You can enter data into only non-key fields in existing records.
- **Entry, InsDel, All**: You can enter new records into the table.

The table's owner can also restrict access to specific fields of the table. The levels of field rights are:

- **None, ReadOnly**: You won't be able to enter values in the field.
- **All**: You can enter values in the field.

Restructure

Sort Edit Coedit DataEntry MultiEntry Restructure
Add, erase, or modify field names and types in a table structure.

As you become more familiar with Paradox and as new situations arise, the way you work with your information may change as well. For example, you might want to enlarge the Position field of *employee* from 15 to 20 characters, or—if you opened new branches—add a Location field to the table.

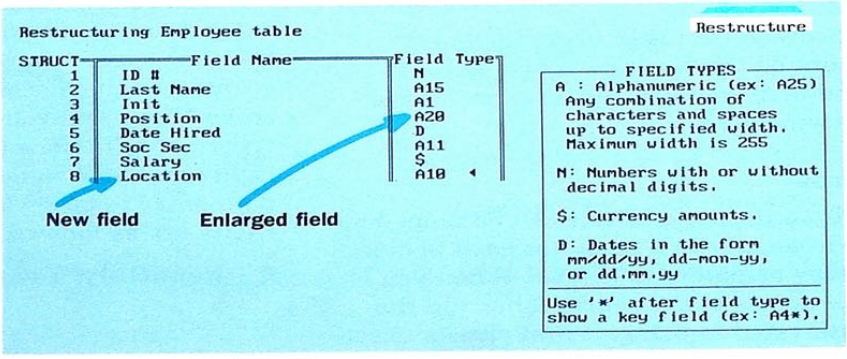
You can use Paradox's **Modify/Restructure** option to change the structure of a table at any time. As explained in Chapter 2, you can also use this option to recover space on your disk after deleting records. When you choose this option and enter a table name, you will see the temporary *struct* table below containing the field definitions, just as when the table was created.

Changing the table structure involves editing the information in the *struct* table, as you would edit any table. You may:

- add new fields
- delete existing fields
- rename fields
- reorder fields
- change field types and lengths
- change key field designations.

Unlike some other database systems, Paradox imposes no penalty for restructuring your tables. The process is as easy as editing a table. As you restructure, Paradox will protect you from losing data. If there is any possibility of data loss, the program will tell you what may be lost and give you the chance to change your mind about restructuring the table. In addition, if either of the temporary tables *problems* or *keyviol* exists, Paradox will ask you to confirm

Restructuring a Table



that it is OK to continue before proceeding with the restructuring. If you want to keep the data in either of these tables, you should rename it before you continue.

When you are finished restructuring the table, press Do-It! [F2]. If you have made any changes that might result in data loss, Paradox will ask you to confirm them before it actually changes the table.

Adding Fields

To insert a new field anywhere in the table, move the cursor directly below the place where you want the new field. Press [Ins] and a blank line will appear above the cursor. Fill in the new field's name and field type.

To add a new field at the end, move to the last row of *struct* and press [↓]. A blank line will appear.

When adding new fields, make sure all key fields are grouped at the beginning of the table.

You can borrow all or part of another table's structure by pressing Menu [F10] and selecting **Borrow**. For details, see Chapter 6 (Create).

Deleting Fields

To delete a field from a table, move the cursor to the field and press [Del]. The field record will disappear.

Since all data in a deleted field will be lost, Paradox will ask you to confirm the deletion before it actually deletes the field. See "Confirming Changes" later in this section.

Renaming Fields

To rename a field in the table, edit the field name in place. As long as you don't explicitly delete the field with [Del], Paradox will know that you are simply renaming the field and will retain its data.

Rearranging Fields

To change the position of a field in the table, use [Ins] to add a blank line at the field's new position. Copy the name from the old position. Paradox automatically will copy the field type to the new position, and then delete the field from the old position.

As you type the field name in the new position, make sure to spell it exactly as it was before. Otherwise Paradox will think you want to delete the old field and create a new one (you would be asked to confirm this). Also, make sure all key fields are grouped at the beginning of the table.

Changing Field Types

You may change a field from one type to another simply by editing the field type specification. While certain changes may potentially cause data loss, Paradox will ask you to confirm any such changes before it makes them.

Shortening an Alphanumeric Field

You may freely change the width of an alphanumeric field. However, data may be lost if you shorten the width.

If you do shorten an **A** field, Paradox will ask you what to do with values that don't fit. You may choose to truncate them or put them in the temporary *problems* table. See "Confirming Changes" later in this section.

Converting to an Alphanumeric Field

Since an alphanumeric (**A**) field can hold letters, numbers, and special characters, you may freely convert any other type of field into an **A** field. However, data may be lost if the field is not large enough to hold the values.

When you convert another type of field to **A**, Paradox will ask you what to do with values that don't fit. You may choose to truncate them or put them in the temporary *problems* table. See "Confirming Changes" later in this section.

Converting to a Number Field

You may freely convert one type of number field (**N**, **$**, or **S**) into another. However, data may be lost when converting to an **S** field if the values are too large for it. Thus, if you are converting to an **S** field, Paradox will ask you what to do with values that don't fit. You may choose to truncate them or put them in the temporary *problems* table. See "Confirming Changes" later in this section.

In addition, you may convert an alphanumeric field into a number field. Any record that contains a non-numeric value in the field will automatically be placed in the temporary *problems* table. You may edit the records in *problems* and then add them back into the restructured table, or rename *problems* to save it.

Converting a date field into a number field will place all the records in the *problems* table.

Converting to a Date Field

You may convert an alphanumeric field into a date field. Any record that contains a non-date value in the field will be placed in the temporary *problems* table. You may edit the records in *problems*, or rename it.

Converting a number field into a date field will place all the records in the *problems* table.

Key Fields

You may change fields from keys to non-keys, or vice versa. The only constraint is that all key fields must be grouped at the beginning of the table in order of precedence (see "Key Fields" in Chapter 6).

So, to change a non-key field to a key field, move it to the beginning of the table and add an asterisk (*) after the field type.

Conversely, to change a key field to a non-key field, move it out of the key field area and erase the *.

If any existing records have duplicate values in the new key fields, they will placed in the temporary *keyviol* table.

Confirming Changes in Cases of Potential Data Loss

Paradox will only ask you to confirm the structure changes you have made if they might cause loss of data. There are two kinds of changes that may cause data loss:

- deleting a field
- converting a field to a shorter type by
  - shortening an **A** (alphanumeric) field
  - converting a field to **A** or **S** (short number) when the new values don't fit.

When you press Do-It! [F2], or select **DO-IT!** from the Restructure menu, Paradox will ask you to confirm any such changes.

Deleting a Field

Delete Oops!
Allow deletion of Cust ID field.

If you have deleted a field from the table, a message naming the field will flash at the bottom of the screen: **Please confirm deletion of field.** The confirmation menu that appears has two choices:

- **Delete**: To go ahead and delete the field, including all data in it
- **Oops!**: To cancel the deletion and return to the *struct* table.

If you choose **Oops!**, go back and type the deleted field back into the struct table.

- **Note**: *You won't be asked to confirm a field deletion if you have simply changed its order by retyping it in a new location.*

Converting a Field to a Shorter Type

Trimming No-Trimming Oops!
Allow trimming Street field value if necessary.

If you have shortened an **A** (alphanumeric) field, or converted another type of field to an **A** or **S** field, the converted field may be too small to hold all the data. A message naming the field will flash at the bottom of the screen: **Possible data loss for field**. The action menu that appears has three choices:

- **Trimming**: To allow the field to be shortened and truncate existing data to fit the new length; any parts of the data that won't fit in the new field will be permanently lost
- **No-Trimming**: To allow the field to be shortened and place records with values that are too long in the temporary *problems* table
- **Oops!**: To cancel the field type change and return to editing the *struct* table.

If you choose **No-Trimming** and wish to save the records that did not fit, you may:

- **edit** the records in the *problems* table, then use the **Tools/More/Add** option to add them to the restructured table, **or**
- **rename** *problems* as a permanent table.

If you choose **Oops!**, you may lengthen the field in the *struct* table.

Effects of Restructuring on Other Objects

When you restructure a table, other objects in its family may be affected. Paradox automatically restructures these objects for you, including forms, reports, indexes, settings, and validity check files.

- If you delete a field, or change a field type in any way, that field will be removed from all forms, reports, indexes, settings, and validity checks. Calculated and summary fields based on the changed field will also be removed.
- If you delete all the fields on a page of a form, the page will be removed from the form. If you delete all the fields on a form, the form itself will be removed.
- If you've established auxiliary passwords for the table, the rights for fields you've changed during restructure will be lost.
- If you change a keyed table to a non-keyed table, any secondary indexes you've set up will no longer be incrementally maintained (see Chapter 12 on maintaining secondary indexes).

You will see messages as each object is restructured.

The Restructure Menu

Borrow Help DO-IT! Cancel
Borrow the structure of an existing table.

While restructuring a table, you can display the Restructure menu by pressing Menu [F10] at any time. It contains these choices:

- **Borrow**: To borrow the structure of another table (see Chapter 6 for details)
- **Help**: To get help about restructuring a table
- **DO-IT!**: To complete the restructure and return to the main workspace (you will be asked to confirm any changes that may cause data loss)
- **Cancel**: To terminate the restructure process, cancel the changes, and return to the main workspace.

Restructuring on a Network

When you select **Modify/Restructure** on a network, Paradox automatically places a full lock on the table and its family. This means that other users cannot access the table or its family for any reason during the restructuring. If someone else on the network has started an operation using the table you want to restructure or any of its family members, you won't be able to begin until that user has finished working with the table.

Validity Checks

Image Undo ValCheck Help DO-IT! Cancel
Define or clear validity checks for the current image.

When you enter, edit, or coedit values in tables, Paradox automatically checks to make sure that the values are valid for the field types you have chosen. For example, it won't let you type letters in a number field or a date that doesn't exist.

The **ValCheck** (validity check) selection on the Edit and DataEntry menus lets you set, clear, and save further requirements and default values for the entries in a field. It also lets you look up and fill in values from another table.

For example, using validity checks, you can specify that values in a Social Security field fit a standard format. Once you have defined your requirements, Paradox will enforce them when values in the field are entered or changed. It can even help by automatically filling in values in the field! Validity checks for a table are automatically saved. You may update them or delete them any time you wish. The validity checks in effect when you end an editing session are stored in a .VAL file as part of the table's family.

Before selecting **ValCheck**, make sure the cursor is in the image you want to set requirements for. When you choose **ValCheck** you will see a menu with two choices:

Define Clear
Define a range, lookup table, or picture check for a field in current image.

- **Define**: To set requirements or default values for a field
- **Clear**: To remove requirements or default values for one or all fields.

Define

Define Clear
Define a range, lookup table, or picture check for a field in current image.

Define lets you set requirements and default values for the fields in the current image. The requirements in effect when you press **Do-It!** to end the edit session will be automatically saved.

When you choose **Define**, Paradox will ask you to point to the field for which you want to set requirements

Use → and ← to move to the field for which you want to set check
then press ↵ to select.

Move to the field you want and press [Enter]. You'll see a menu of the kinds of validity checks you can set. There are six choices:

LowValue HighValue Default TableLookup Picture Required
Specify the lowest acceptable value for the field.

- **LowValue**: To set the minimum value in the field you selected
- **HighValue**: To set the maximum value in the field
- **Default**: To set a standard value that Paradox will insert if you leave the field blank
- **TableLookup**: To require that values in the field already exist in another table, and to automatically fill in the values from fields in one table to the fields of another
- **Picture**: To require that values in the field have a certain picture format
- **Required**: To require a value in the field for every new record in the table.

You can combine any or all of these options for a single table or field.

LowValue

LowValue HighValue Default TableLookup Picture Required
Specify the lowest acceptable value for the field.

LowValue sets the minimum acceptable value for a field. For example, you can require that the quantity of an item ordered be at least 10.

In a date field, you can use the keyword *today* to indicate that no value earlier than today's date can be entered into the field. Of course, your computer's system clock must be set correctly in order for this feature to work properly.

Although **LowValue** is most commonly used for number and date fields, you can also use it to set a minimum in alphanumeric fields. In this case, Paradox uses the currently-set sort order to determine the acceptable range of values that you can enter into the field.

When you select **LowValue**, Paradox will prompt you for the minimum value:

Value:
Enter the lowest acceptable value for this field.

Type the value and press [Enter]. Paradox will check values against your minimum.

HighValue

LowValue HighValue Default TableLookup Picture Required
Specify the highest acceptable value for the field.

HighValue sets the maximum acceptable value for a field. For example, you could require that a credit limit be no more than $10,000.

In a date field, you can use the keyword *today* to indicate that no value later than today's date can be entered into the field. Of course, your computer's system clock must be set correctly in order for this feature to work properly.

Although **HighValue** is most commonly used for number and date fields, you can also use it in alphanumeric fields to set a maximum alphabetical value. In this case, Paradox uses the currently-set sort order to determine the acceptable range of values that you can enter into the field. For example, in a State field, you could set a **LowValue** of **AK** combined with a **HighValue** of **WY**.

When you select **HighValue**, Paradox will prompt you for the maximum value:

Value:
Enter the highest acceptable value for this field.

Type the value and press [Enter]. Paradox will check values against your maximum.

Default

LowValue HighValue Default TableLookup Picture Required
Specify a value to use if the field is left blank.

Default sets a standard value for a field. For example, if orders are most commonly placed for a quantity of one item, you can set a default of **1** in the Quant field of *orders*. If you place the cursor in the field but don't type anything there Paradox will enter the **1** for you when the cursor leaves the field.

For date fields, you can set a default value of *today*. Paradox will fill in today's date if you don't enter a value for it. Of course, your computer's system clock must be set correctly in order for this feature to work properly.

When you select **Default**, Paradox will prompt you for the value:

Value:
Enter the value to insert if the field is left blank.

Type the value and press [Enter]. Paradox will insert your default value each time you leave the field blank.

TableLookup

LowValue HighValue Default TableLookup Picture Required
Specify allowable values, lookup and fill in fields from another table.

TableLookup is a powerful feature that lets you:

- require that the values you enter into a field exist in the first field of another table
- refer to another table to lookup the acceptable values for a field

- automatically copy values in the lookup table to the table you are editing (automatic fill in).

These capabilities are available during edit, coedit, and data entry sessions.

When you specify **TableLookup**, entries you make in the current field of the table you are editing must exist in the first field of the lookup table. For example, in an order entry application, you may want to make sure that you have customer information on file for everyone who places an order. You could use TableLookup to specify that any Cust ID value entered in the *orders* table must be present in the Cust ID field of the *customer* table.

Similarly, you could require that any Stock # entered into *orders* is the number of an existing item in *products*. Or, that the Emp # used in *orders* to identify the sales clerk who made a sale must already exist in *employee*.

If you're not sure of a particular customer's number, there are options in **TableLookup** to let you browse in the lookup table. With automatic-fill in, when you find the customer ID you are looking for, Paradox can automatically copy the value from the lookup table.

You can also specify that you want values in additional fields to be copied from the lookup table to the table you're editing. For instance, you can specify that when you enter a customer's ID number on an order entry form you want Paradox to automatically fill in the customer's name and address.

Keep three things in mind when setting up a lookup table:

- The field in which the values are to be looked up must be the first field of the lookup table.
- The lookup field must have the same field type as the current field in the edited table (the names of the two fields do not have to be the same).
- For best performance, if the lookup table is large, its first field should be keyed (but only the first field can be part of the key). See "Key Fields" in Chapter 6 (Create) for details on key fields.

You can set up as many lookups as there are fields in the table you're editing.

When you select TableLookup, Paradox will prompt you for the name of a table to use as a lookup table:

```
Table:
Enter name of table to check values against, or press ↵ for a list of tables.
```

Enter the name of the lookup table you want to use, or press [Enter] and select it from a menu. You will then see a submenu with two choices:

```
JustCurrentField  AllCorrespondingFields
Check entered values in current field against stored values in the lookup table.
```

- **JustCurrentField**: To check entries in the current field against a lookup table, or to copy a value from the first field of the lookup table into the current field.
- **AllCorrespondingFields**: To check entries in the current field against a lookup table and to copy values from the lookup table into all fields with the same name in the table being edited.

Both selections allow you to prevent direct access to the lookup table during an editing or data entry session. Alternatively, you can specify that you want to be able to press Help [F1] to browse through the lookup table and select fields from a particular record to be automatically filled into the table you're editing.

JustCurrentField

```
JustCurrentField  AllCorrespondingFields
Check entered values in current field against stored values in the lookup table.
```

JustCurrentField tells Paradox you want to check values you enter in the current field against the values in the first field of the lookup table and, optionally, to automatically fill in values from the lookup table into the current field. When you select **JustCurrentField**, you'll see a further submenu with two choices:

```
PrivateLookup  HelpAndFill
Check entered values against stored values; prevent access to lookup table.
```

- **PrivateLookup**: To prevent access to the lookup table itself during the edit or data entry session.
- **HelpAndFill**: To allow browsing through the lookup table and fill in the lookup value automatically.

PrivateLookup When you select **PrivateLookup**, Paradox will check each entry in the current field against the values stored in the first field of the lookup table. If the entry does not match any of the lookup values, when you try to move the cursor out of the field you will see the message **Not one of the possible values for this field.** At this point, you have two options:

- correct the value so that it matches one of the values in the lookup table, or
- leave the field blank (unless you've set a **Required** validity check for this field).

JustCurrentField/PrivateLookup is most useful for applications in which you want to protect information in the lookup table. When you use this option Paradox will use the lookup table to validate entries in the current field of the table being edited, but will not allow the user to see the lookup table during an edit, coedit, or data entry session.

To completely secure the contents of the lookup table, it is advisable to password protect it using the **Tools/More/Protect/Password** selection. See Chapter 10 (Tools) for details.

HelpAndFill Like **PrivateLookup**, **HelpAndFill** requires that entries in the current field exist in the first field of the lookup table. In addition, **HelpAndFill** lets you view the values in the lookup table and automatically copy them into the table you're editing.

Each time you move the cursor to the field for which you've defined a **HelpAndFill** validity check, Paradox will tell you that help is available by displaying a prompt on the second line of the screen.

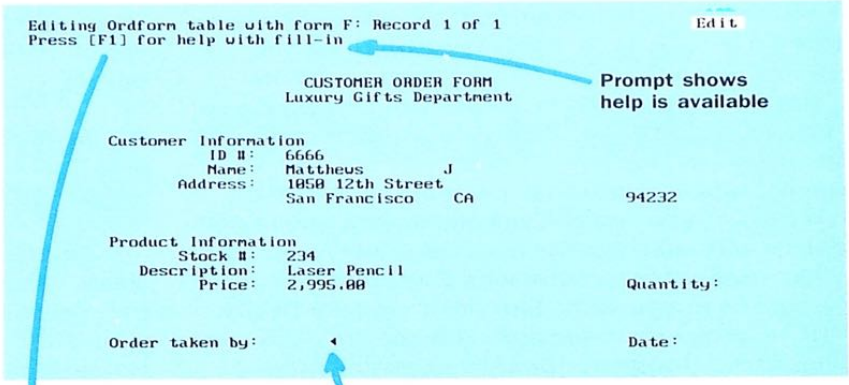
You can either enter a value for the current field or, if you don't know or can't remember what the valid values are and want to look at the entries in the lookup table, press Help [F1]. Paradox will place the lookup table on the workspace. At this point, you can:

- Use the cursor keys to scroll through the lookup table to find the record with the value you're

7-7. Automatic Fill-In of a Lookup Field

Suppose you have a table called *ordform* that is used to enter order information. You want to include the *Emp #* of the salesperson who has handled each order, and want to make sure that the data are valid. You could set up a **JustCurrentField/HelpAndFill** validity check using *employee* as the lookup table.

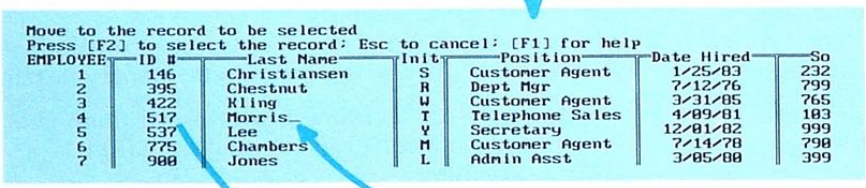
Using the support provided by **JustCurrentField/HelpAndFill**, if the user filling out the order entry form doesn't know the employee number of a particular salesperson, she can press Help [F1] and scan through all the names in *employee*. When she places the cursor on the correct name and presses Do-It! [F2], Paradox automatically fills in the salesperson's employee number in the *ordform* table.



Prompt shows help is available

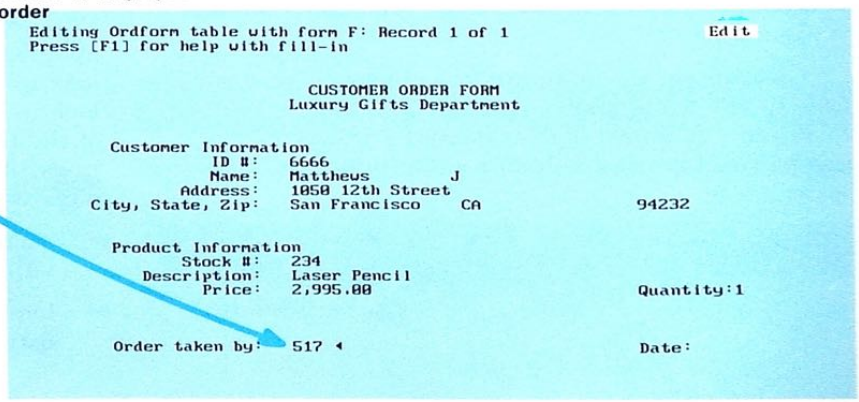
Pressing [F1] places lookup table on workspace

Cursor in Emp # field



Cursor moved to record of employee who handled the order

Press Do-It! [F2] to copy Emp # to *ordform* automatically



looking for. Remember that the lookup values are contained in the first field of the lookup table.

- Use Zoom [Ctrl][Z] and Zoom Next [Alt][Z] to search for a particular value in the lookup table. Zoom and Zoom Next are described in the section on **Image/Zoom/Value** in Chapter 8 (Image).
- Press [Esc] to return to the table you're editing without automatically filling in a value from the lookup table.
- Press Do-It! [F2] when you've found the record with the value you're interested in. This fills in the current value in the first field of the lookup table into the current field of the table being edited.

Example 7-7 illustrates how the automatic fill-in works.

AllCorrespondingFields

JustCurrentField AllCorrespondingFields
Check and fill in values from all corresponding fields in the lookup table.

Like **JustCurrentField**, **AllCorrespondingFields** tells Paradox to check entries in the current field against the values in the first field of the lookup table. In addition, it also tells Paradox to automatically fill in values from corresponding fields in the lookup table. Corresponding fields must have identical names and compatible field types. Depending on the option you choose, you decide whether or not to allow the user to get help by browsing in the lookup table.

When you select **AllCorrespondingFields** you'll see a further submenu with two choices:

FillNoHelp HelpAndFill
Check values, no browsing in lookup table, fill values in corresponding fields.

- **FillNoHelp:** To prevent browsing in the lookup table itself.
- **HelpAndFill:** To allow browsing in the lookup table to find the record to copy.

The only difference between the two options is that **HelpAndFill** allows you to obtain help by browsing in the lookup table, while **FillNoHelp** prevents accessing the lookup table during an editing or data entry session.

FillNoHelp Like the other **TableLookup** options, the **AllCorrespondingFields/FillNoHelp** selection checks to make sure that entries you make in the current field of the table you're editing match values stored in the first field of the lookup table.

If the lookup table and the table you're editing have any **corresponding fields** (fields with the same name), Paradox then goes one step further. When you make a valid entry in the current field, Paradox automatically fills values from the lookup table into the corresponding fields in the table you're editing. The fill in takes place when you move the cursor away from the current field.

You can use **AllCorrespondingFields/FillNoHelp** to have Paradox automatically substitute one value for another. To do this, the name of the current field in the table you are editing must have the same name as the field in the lookup table containing the information to be substituted. This technique is illustrated in Example 7-8.

Because **AllCorrespondingFields/FillNoHelp** prevents direct access to the lookup table itself, it is useful in applications in which you want to prevent others from seeing certain information stored there. When you use this option, Paradox uses the lookup table to validate entries in the current field of the table being edited, and to fill in values from corresponding fields, but does not allow the user to see the lookup table itself during an edit, coedit, or data entry session.

To completely secure the contents of the lookup table, it is advisable to password protect it using the **Tools/More/Protect/Password** selection. See Chapter 10 (Tools) for details.

HelpAndFill The **HelpAndFill** option provides the maximum level of lookup and fill in support. Each time you move the cursor to the field for which you've defined a **HelpAndFill** validity check, Paradox will tell you that help is available by displaying a prompt on the second line of the screen.

You can either enter a value for the current field or, if you don't know or can't remember the valid values for the current field and want to look at the entries in the lookup table, press Help [F1]. Paradox will place the lookup table on the workspace. At this point, you have these options:

- Use the cursor keys to scroll through the lookup table to find the record with the value you're looking for. Remember that the lookup values are contained in the first field of the lookup table.
- Use Zoom [Ctrl][Z] and Zoom Next [Alt][Z] to search for a particular value in the lookup table. Zoom and Zoom Next are explained in the description of **Image/Zoom/Value** in Chapter 8 (Image).
- Press [Esc] to return to the table you're editing without automatically filling in a value from the lookup table.
- Press Do-It! [F2] when you've found the record with the values you're interested in. Paradox will copy the values from fields in the current record

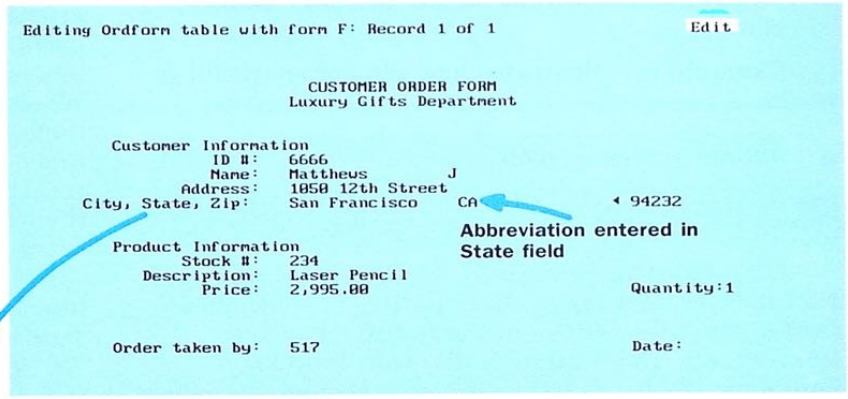
of the lookup table into the corresponding fields (those with the same name) of the table being edited.

Example 7-9 illustrates one way to use the capabilities of **AllCorrespondingFields/HelpAndFill** in the order entry application described in Example 7-7.

7-8. Automatic Substitution of Values

Suppose you want to have state names spelled out when you print invoices. You could create a table called *stateabv* containing state names and their corresponding abbreviations and use **AllCorrespondingFields/FillNoHelp** to set it as a lookup table for *ordform*. Then, when you type the abbreviation for a state in *ordform*, Paradox will automatically substitute the spelled-out name for the abbreviation you entered.

When you enter an abbreviation in the State field of *ordform*, Paradox checks the lookup (first) field of *stateabv* to see that your entry is valid. Then, because *ordform* and *stateabv* have State as a corresponding field, Paradox copies the value from State in *stateabv* to State in *ordform*. Because State was the field you originally typed into, this has the effect of substituting the spelled-out name for the abbreviation.

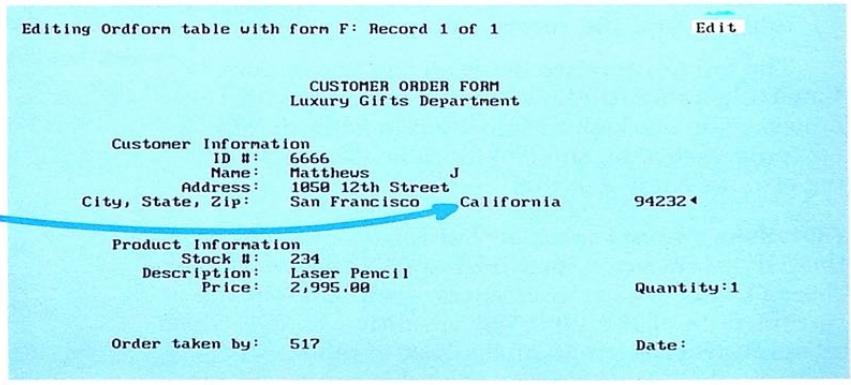


Corresponding fields

STATEABV	Abvs	State
1	AL	Alabama
2	AK	Alaska
3	AZ	Arizona
4	AR	Arkansas
5	CA	California
6	CO	Colorado
7	CT	Connecticut
8	DE	Delaware

Fields in *stateabv* can't be viewed

Spelled-out state name automatically replaces abbreviation when cursor is moved away from State field



7-9. Automatic Fill-In of Corresponding Fields

Suppose you want to include each customer's name and address in *ordform*, but don't want to re-enter information you already have stored in *customer*. You could use **AllCorrespondingFields/HelpAndFill** to automatically fill in all the relevant fields from *customer*.

Once this option is selected, when you point to the *customer* record you want and press DO-It! [F2], the values from all corresponding fields are filled into *ordform*. This can take place only for fields in *ordform* whose names exactly match the field names in *customer*.

Prompt shows help is available

```
Editing Ordform table with form F: Record 2 of 2                    Edit
Press [F1] for help with fill-in

                          CUSTOMER ORDER FORM
                        Luxury Gifts Department

      Customer Information
            Cust ID #:
     Last Name, Init.:
             Street:
     City, State, Zip:

      Product Information
            Stock #:
        Description:
              Price:                                        Quantity:

      Order taken by:                                       Date:
```

Corresponding fields

Cursor in Cust ID field

Press Help [F1] to put lookup table on workspace

```
Move to the record to be selected
Press [F2] to select the record: Esc to cancel: [F1] for help.
CUSTOMER Cust ID   Last Name     Init Street                City
    1    1386     Aberdeen       F    45 Utah Street        Washington
    2    1388     Svenvald       I    Gouvernment House     Reykjavik
    3    1784     McDougal       L    4950 Pullman Ave NE   Seattle
    4    2177     Bonneferme     S    128 University Drive  Stanford
    5    2579     Chavez         L    Cypress Drive         Palm Springs
    6    2779     Fahd           S    The Palace            Riyadh
    7    3128     Elspeth, III   R    1 Hanover Square      London
    8    3266     Hanover        A    15 State Street       Dallas
    9    3271     Massey         C    29 Aragona Drive      Oxon Hill
   10    3771     Montaigne      L    38 Tauton Drive       Bellevue
   11    4277     Matthews       R    P. O. Box 20336       Albuquerque
```

Move cursor to record of customer who placed the order

Press Do-It! [F2] to copy customer's record

```
Editing Ordform table with form F: Record 2 of 2                    Edit
Press [F1] for help with fill-in

                          CUSTOMER ORDER FORM
                        Luxury Gifts Department

      Customer Information
            Cust ID #:   3271
     Last Name, Init.:   Massey          C
             Street:     29 Aragona Drive
     City, State, Zip:   Oxon Hill       MD                29902

      Product Information
            Stock #:
        Description:
              Price:                                        Quantity:

      Order taken by:                                       Date:
```

Additional TableLookup Considerations

When you are setting up a table lookup, keep these additional considerations in mind:

- **Access rights**: You must have sufficient access rights to the lookup table and the table being edited to be able to set up or use a table lookup. The owner of the tables may have restricted your rights to view or change them; if so, you may not be able to either define or use a table lookup.

  Specifically, you must have sufficient rights to view the lookup table and the fields involved in the lookup, and be able to modify any fields of the table being edited which are to be filled in. You'll see a message if you don't have sufficient access rights.

- **No validity checks on corresponding fill-in fields**: If you've defined validity checks for the table being edited other than the table lookup itself, these checks will only be applied to the field for which the lookup is actually defined (even if the fill-in is used to substitute values in the lookup field). Any validity checks defined for other corresponding fields in the table being edited will not be enforced when values are filled in from a lookup table.

- **One lookup or fill-in can't automatically trigger another**: Suppose you've defined a table lookup for *orders* that uses *customer* to check the validity of the Cust ID field. In addition, it automatically fills in a corresponding City field. You can't use the value that Paradox fills into City to trigger a further lookup to check the validity of the City entry or that fills in other corresponding fields in *orders*. Note, however, that in the context of a linked multitable form, an automatic fill-in applied to the link key of the master table will automatically cause the corresponding key fields of the detail to be filled in.

Picture

LowValue HighValue Default TableLookup Picture Required
Specify a PAL picture format for acceptable values.

Picture sets up the requirement that the values in a field conform to a **picture format**. For example, you could require values in a Phone field to fit the standard U.S. phone number format ###-####, or values in a Social Security Number field to fit ###-##-####.

Here are some additional examples of picture formats:

Format	Required value
[(###)]###-####	Phone number with optional area code
&*?	Alphabetic string of any length with the first letter capitalized
#####[-####]	5- or 9-digit zip code
Yes, No	Value may be either yes or no

Table 7-2 shows the available pattern elements. You can also include constants (like the hyphens above) in a picture format. When you come to a constant while entering a value, Paradox will type it automatically. These pattern elements are also used in the Paradox Application Language (PAL). For more information about how to use these elements in picture formats, see Chapter 5 of the *PAL User's Guide*.

	Stands for
#	Numeric digit
?	Letter (A-Z or a-z)
&	Letter (convert to uppercase)
@	Any character
!	Any character (convert to uppercase)
;	Take literally
*	Repetition counts
[ ]	Optional items
{ }	Grouping operator
,	Alternative values

When you select **Picture**, Paradox will prompt you to enter the picture:

Picture
Enter a PAL picture format, (e.g.###-##-####)

Type the picture format and press [Enter]. Paradox will check values against your picture format until you end the current edit session.

Required

LowValue HighValue Default TableLookup Picture Required
Specify whether the field may left blank.

Required indicates whether or not a field must have a value (that is, whether blank values are allowed). For example, you can specify that no record could be added to the *customer* table without a Cust ID.

When you select **Required**, you will see a menu asking you whether a value in the field is required:

No Yes
Field must be filled.

Select **Yes** to require a value in the field or **No** to indicate that blank values are allowed. If you re-

quire a value, Paradox will not let you leave the field until a value is entered.

Clear

Define Clear
Remove validity checking from some or all fields in the current image.

The **Clear** selection on the ValCheck menu lets you clear validity checks you have previously set. When you choose **Clear**, a menu will ask you whether you want to clear checks from one field or from the entire table:

- **Field**: To clear validity checks from one field of the current table
- **All**: To clear validity checks from all fields of the current table.

Field

Field All
Remove validity checks from one field.

Field lets you remove all validity checks from one field in the current table. When you select **Field**, Paradox will ask you to point to the field with the validity checks you want to clear:

Use → and ← to move cursor to field from which you want to remove checks...
then press ↵ to select it.

Move to the field you want to clear and press [Enter]. Paradox will remove all validity checks from the field. (If you had saved them, the checks will be restored the next time you edit the table.)

All

Field All
Remove checks from all fields in the current image.

When you select **All** from the ValCheck/Clear menu, Paradox will remove all validity checks from all fields of the current table.

Editing with Validity Checks

If you enter a value that violates a validity check you have set, you will see a message identifying the problem. For example, if you enter an order quantity of 0 when the **LowValue** is 1, Paradox will explain that **Value no less than 1 is expected.**

Since Paradox will not let you leave the field with an invalid value, there are four things you can do:

- **edit** the value so that it is valid
- use [Backspace] or [Ctrl][Backspace] to **clear** the field
- press Undo [Ctrl][U] to erase the invalid value and move out of the field
- if a TableLookup with the **HelpAndFill** option has been established, press Help [F1] for help in determining the valid values for the field.

Validity Checks on a Network

On a network, the owner of a table may restrict access to that table's validity checks. In this case, you must present a password granting you sufficient rights to the table before you can define or change them.

Image

View Ask Report Create Modify **Image** Forms Tools Script Help Exit

Resize or reformat an image; move to a field, record, or value; pick a form.

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ColumnSize 168
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Format 169
- Formatting a Number Field 169
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Image lets you change the arrangement of information on the screen (but not the data itself), making it easier to work with. Unless you explicitly save them, these changes will be temporary.

The Image Menu

The **Image** options always work on the current image (the one containing the cursor). Before choosing **Image** from the Main menu, make sure the table or form you want to work with is displayed on the workspace.

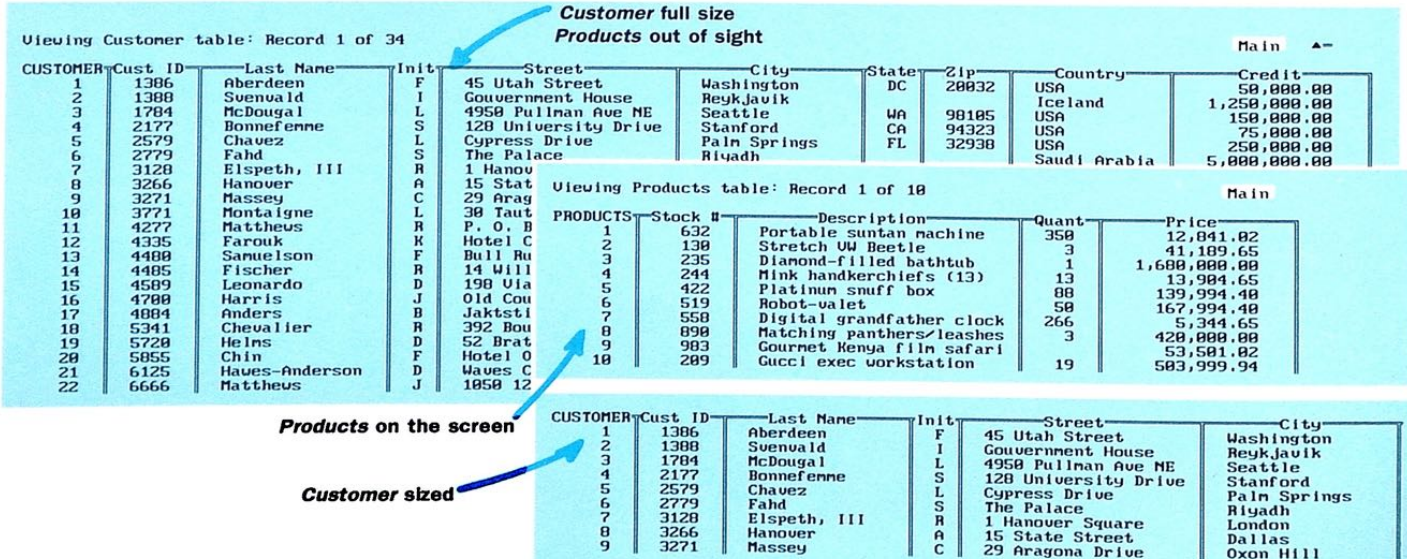
Table View

TableSize ColumnSize Format Zoom Move PickForm KeepSet Graph
Change the number of records to show in the current image.

When you choose **Image** and a table is displayed, you will see the Image menu. It offers these choices:

- **TableSize**: To change the number of records displayed in the image at one time
- **ColumnSize**: To enlarge or reduce the width of a field
- **Format**: To change the way numbers and dates are displayed
- **Zoom**: To move the cursor to a particular field, record, or value
- **Move**: To rearrange fields in the image
- **PickForm**: To select a form to display records in the table
- **KeepSet**: To save the changed image settings for the table
- **Graph**: to design, view, or print a graph; or to crosstabulate a table.

Images on the Screen



Viewing Customer table: Record 1 of 34 — Main

CUSTOMER	Cust ID	Last Name	Init	Street	City	State	Zip	Country	Credit
1	1386	Aberdeen	F	45 Utah Street	Washington	DC	20032	USA	50,000.00
2	1388	Svenvald	I	Gouvernment House	Reykjavik			Iceland	1,250,000.00
3	1784	McDougal	L	4950 Pullman Ave NE	Seattle	WA	98105	USA	150,000.00
4	2177	Bonnefenne	S	128 University Drive	Stanford	CA	94323	USA	75,000.00
5	2579	Chavez	L	Cypress Drive	Palm Springs	FL	32938	USA	250,000.00
6	2779	Fahd	S	The Palace	Riyadh			Saudi Arabia	5,000,000.00
7	3128	Elspeth, III	R	1 Hanov					
8	3266	Hanover	A	15 Stat					
9	3271	Massey	C	29 Arag					
10	3771	Montaigne	L	30 Taut					
11	4277	Matthews	R	P. O. B					
12	4335	Farouk	K	Hotel C					
13	4400	Samuelson	F	Bull Ru					
14	4405	Fischer	R	14 Will					
15	4509	Leonardo	D	198 Via					
16	4700	Harris	J	Old Cou					
17	4804	Anders	B	Jaktsti					
18	5341	Chevalier	R	392 Bou					
19	5720	Helms	D	52 Brat					
20	5855	Chin	F	Hotel O					
21	6125	Haves-Anderson	D	Waves C					
22	6666	Matthews	J	1050 12					

Viewing Products table: Record 1 of 10 — Main

PRODUCTS	Stock #	Description	Quant	Price
1	632	Portable suntan machine	350	12,841.02
2	130	Stretch VW Beetle	3	41,189.65
3	235	Diamond-filled bathtub	1	1,680,000.00
4	244	Mink handkerchiefs (13)	13	13,904.65
5	422	Platinum snuff box	88	139,994.40
6	519	Robot-valet	50	167,994.40
7	558	Digital grandfather clock	266	5,344.65
8	890	Matching panthers/leashes	3	420,000.00
9	983	Gourmet Kenya film safari		53,501.02
10	209	Gucci exec workstation	19	503,999.94

CUSTOMER	Cust ID	Last Name	Init	Street	City
1	1386	Aberdeen	F	45 Utah Street	Washington
2	1388	Svenvald	I	Gouvernment House	Reykjavik
3	1784	McDougal	L	4950 Pullman Ave NE	Seattle
4	2177	Bonnefenne	S	128 University Drive	Stanford
5	2579	Chavez	L	Cypress Drive	Palm Springs
6	2779	Fahd	S	The Palace	Riyadh
7	3128	Elspeth, III	R	1 Hanover Square	London
8	3266	Hanover	A	15 State Street	Dallas
9	3271	Massey	C	29 Aragona Drive	Oxon Hill

In addition, the Rotate [Ctrl][R] key is a shortcut for **Move** and the Zoom [Ctrl][Z] key is a shortcut for **Zoom/Value**. None of these choices affects the data in the table in any way, just the way they are displayed on the screen.

Form View

Format Zoom PickForm KeepSet Graph
Change the format of a field.

When you select **Image** and a form is displayed, only five choices are available, **Format**, **Zoom**, **PickForm**, **KeepSet**, and **Graph**. These options have the same effect as in the table view. Rotate [Ctrl][R] has no effect.

TableSize

TableSize ColumnSize Format Zoom Move PickForm KeepSet Graph
Change the number of records to show in the current image.

When a table is displayed on the screen, its image contains as many records as there are in the table, up to a maximum of 22. One image may squeeze others off the screen. (The workspace status indicator in the top right corner of the screen will tell if there are other images hidden above or below the current one.)

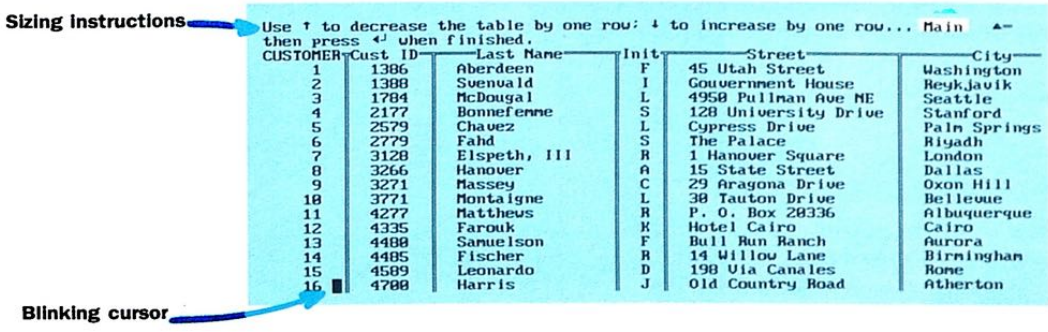
If you are working with more than one table at a time, you may want to reduce the number of records shown in an image so that the other images may be displayed as well. You can use **TableSize** to alter the number of records in view in the current table. It has no effect in form view.

When you choose **TableSize** from the Image menu, the cursor will appear as a blinking box in the last row of the current image. You can press

- [↑] to shorten the display by one row, down to a minimum of two rows
- [↓] to lengthen the display by one row, up to a maximum of 22
- [Home] or [End] to move quickly to the minimum or maximum number of records
- [Enter] to complete the process and resize the table
- [Esc] to cancel the sizing process and return to the Image menu.

The new table size will last only while the image remains on the workspace.

Sizing a Table



Use ↑ to decrease the table by one row; ↓ to increase by one row... Main
then press ↵ when finished.

CUSTOMER	Cust ID	Last Name	Init	Street	City
1	1386	Aberdeen	F	45 Utah Street	Washington
2	1388	Svenvald	I	Gouvernment House	Reykjavik
3	1784	McDougal	L	4950 Pullman Ave NE	Seattle
4	2177	Bonnefemme	S	128 University Drive	Stanford
5	2579	Chavez	L	Cypress Drive	Palm Springs
6	2779	Fahd	S	The Palace	Riyadh
7	3128	Elspeth, III	R	1 Hanover Square	London
8	3266	Hanover	A	15 State Street	Dallas
9	3271	Massey	C	29 Aragona Drive	Oxon Hill
10	3771	Montaigne	L	30 Tauton Drive	Bellevue
11	4277	Matthews	R	P. O. Box 20336	Albuquerque
12	4335	Farouk	K	Hotel Cairo	Cairo
13	4480	Samuelson	F	Bull Run Ranch	Aurora
14	4485	Fischer	R	14 Willow Lane	Birmingham
15	4589	Leonardo	D	198 Via Canales	Rome
16	4700	Harris	J	Old Country Road	Atherton

ColumnSize

TableSize ColumnSize Format Zoom Move PickForm KeepSet Graph
Change a column format in the current image.

The width of a field on the screen is set automatically by Paradox, depending on its field type. However, you can use the **ColumnSize** selection to override this default display width. For example, you may want to narrow the fields in an image to fit more of them on the screen at once. Resizing a field on the screen does not affect its width in the actual table on the disk.

When you choose **ColumnSize** from the Image menu, the cursor will become a blinking box. Paradox will ask you to point to the field you want to size:

Use ← and → to move the column you want to resize...
then press ↵ to select it...

Move to the field you want and press [Enter]. Now you can press

- [→] to widen the field by one character
- [←] to narrow the display by one character
- [Home] or [End] to move quickly to the minimum or maximum width
- [Enter] to complete the process and resize the field
- [Esc] to cancel the sizing process and return to the pointing prompt.

Unless you use **KeepSet** to save the new field size, it will last only while the image remains on the workspace.

Limits on Column Size

The minimum display width of any field is one character.

The maximum display width of a field depends on its name and field type. You will hear a beep when you reach the maximum.

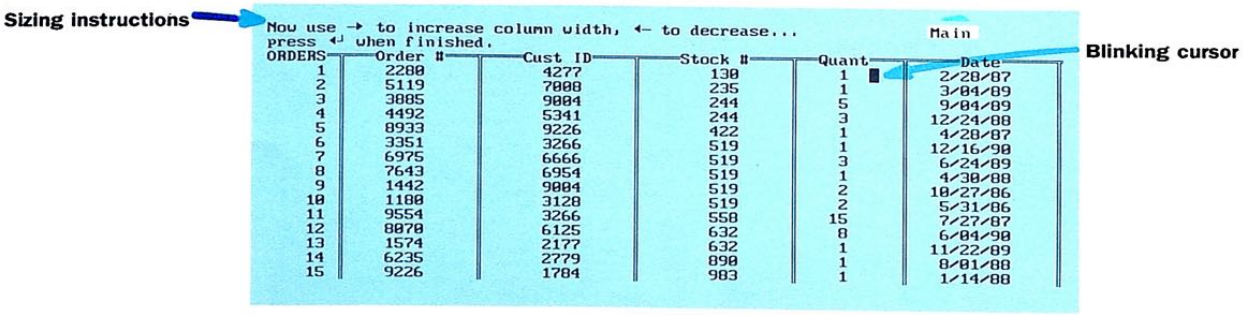
- A **number** (**N**, **$**, and **S**) field may not be wider than 25 characters. The maximum will be even less if the field name is short.
- A **date** (**D**) field may not be wider than 14 characters unless the field name is longer.
- An **alphanumeric** (**A**) field may not be wider than its defined field width or the display width of the screen (76 characters in table view), whichever is less. That is, an **A12** field may not be wider than 12 characters unless the field name is longer, but it can be narrower. An **A130** field may not display more than 76 characters at a time.

Values that Don't Fit

Resizing a field in an image on the screen does not affect the values stored in the table itself. However, it may affect their appearance on the screen if the values are too long for the resized field. How they are displayed was explained in "Viewing Values that Don't Fit" in Chapter 3 (View).

If part or all of a value is hidden, you can view or edit it without resizing the field by pressing Field View [Alt][F5] and scrolling through the value.

Sizing a Column



ORDERS	Order #	Cust ID	Stock #	Quant	Date
1	2280	4277	130	1	2/28/87
2	5119	7008	235	1	3/04/89
3	3885	9004	244	5	9/04/89
4	4492	5341	244	3	12/24/88
5	8933	9226	422	1	4/28/87
6	3351	3266	519	1	12/16/90
7	6975	6666	519	3	6/24/89
8	7643	6954	519	1	4/30/88
9	1442	9004	519	2	10/27/86
10	1180	3128	519	2	5/31/86
11	9554	3266	558	15	7/27/87
12	8070	6125	632	8	6/04/90
13	1574	2177	632	1	11/22/89
14	6235	2779	890	1	8/01/88
15	9226	1784	983	1	1/14/88

Format

TableSize ColumnSize Format Zoom Move PickForm KeepSet Graph
Change a column format in the current image.

Paradox automatically displays number and date values in a default (standard) format that will usually meet your needs. However, you can use the **Format** selection to override the default format. For number (**N** and **$**) fields, you can decide how many decimal places to display, whether to separate groups of digits with whole number separators, how to display negative numbers, and whether to use scientific notation. For date (**D**) fields, you can choose between the three Paradox on-screen date formats. Formatting a field on the screen does not affect the values in the actual table on the disk.

Alphanumeric (**A**) and short number (**S**) fields have a single (standard) format; they cannot be reformatted.

When you choose **Format** from the Image menu, the cursor will turn into a blinking box. Paradox will ask you to point to the field you want to format:

Use ← and → to move to the field you want to reformat...
then press ↵ to select it.

Move to the **N**, **$**, or **D** field you want and press [Enter]. What happens next depends on whether you chose a number or date field.

Formatting a Number Field

General Fixed Comma Scientific
Standard format; all numbers justified in the column.

If you have chosen a number (**N** or **$**) field to reformat, you will see a menu with four choices:

- **General**: To display only as many decimal places as necessary to show each value up to a specified maximum
- **Fixed**: To set a fixed number of decimal places for all values in the field
- **Comma**: To separate 3-digit groups with whole digit separators and parenthesize negative numbers
- **Scientific**: To display values in exponential notation.

After you choose a format, Paradox will ask you for the number of decimal places to include:

Number of decimal places:
Enter the number of digits to show after the decimal point (0...15)

The default value is 2, but you can replace it with any number between 0 and 15. If you choose a large number, you may want to use **Image/Column-Size** to enlarge the display width of the field so that the values can be shown.

The default format for **N** fields is **General** and for **$** fields is **Comma**, both with 2 decimal places. Table 8-1 shows how sample values are displayed in each format with 2 and 5 decimal places.

Unless you use **KeepSet** to save the new format, it will last only while the image remains on the workspace.

Note that all values in Table 8-1 are displayed using the U.S. format for numbers. You can't use **Image/Format** to change between the U.S. and International number formats. The default number format depends upon the country group selected during installation. You can change this default through the Custom Configuration Program. See "International Features" in Chapter 2 (Fundamentals) and "Custom Configuration" in Chapter 14 (Advanced Topics) for details.

General

General Fixed Comma Scientific
Standard format; all numbers justified in the column.

General format provides the most natural view of each value in a field. It shows as many decimal places as necessary to display each value (up to the limit you set); trailing zeros are dropped. As shown in Table 8-1, values in a General field may have different numbers of decimal places, but all the decimal places will be aligned.

In **General** format, whole number separators are not used and negative numbers are prefixed with a – sign.

Fixed

General Fixed Comma Scientific
Fixed number of decimal places (x.xx) or (x,xx).

In **Fixed** format, you set the number of decimal places that are shown for all the values in the field. Any trailing zeros are shown. Whole number separators are not used and negative numbers are prefixed with a – sign.

Comma

General Fixed Comma Scientific
Separators inserted; negatives in parenthesis (x,xxx.xx) or (x.xxx,xx).

In **Comma** format, each group of three whole digits is separated and negative numbers are parenthesized. A "," is used as the whole number separator in the U.S. format, and a "." is used in the International format. Otherwise **Comma** is the same

as **Fixed**; the number of decimal places you choose applies to all the values in the field.

Scientific

General Fixed Comma Scientific
Exponential format (x.xxE+xx) or (x,xxE+xx).

In **Scientific** format, all numbers are displayed in exponential notation—a decimal number between 1 and 10 multiplied by an exponent of 10. For example, the value *1234* may be expressed as **1.234 * 10 ³**, or **1.234E+03**. You may find **Scientific** format easier when working with very large and very small numbers.

In **Scientific** format, whole number separators are not used (there are no whole number groups to separate) and negative numbers are preceded with a – sign. The number of decimal places you choose applies to all the values in the field.

Numbers that Don't Fit

In a Paradox **N** or **$** field, you can store values between $\pm 10^{-307}$ and $\pm 10^{308}$ with up to 15 significant digits. As mentioned earlier in this section, formatting a field on the screen does not affect the values stored in the table itself. However, it may affect their appearance on the screen if the field's format is too long for its display width, or if the values contain more decimal places than you set.

If a field's format is too long for its display width, the values will be displayed as asterisks. You may want to use **Image/ColumnSize** to enlarge such fields; if you don't, you must use Field View [Alt][F5] to view and edit the values.

If a value contains more decimal places than its format, its display will be rounded to fit the format. In Table 8-1, notice how the value 1234.0002 is rounded to 1234, 1234.00, or 1.23E + 03 in the 2-decimal formats, while 1234.567 is rounded to 1234.57 or 1.23E+03. When you land on a rounded field, the cursor will appear at the beginning of the value instead of the end. When you are editing, an asterisk (*) will appear to remind you that part of the value is hidden and you must use FieldView [Alt][F5] to edit it.

If a value is too large or too small to store in **General** format, Paradox will automatically convert it to **Scientific** notation.

Formatting a Date Field

MM/DD/YY DD-Mon-YY DD.MM.YY
All numeric month, day, year: e.g. 09/22/45.

If you have chosen a date (**D**) field to reformat, you will see a menu with three choices:

- **MM/DD/YY**: To display dates like 2/6/88
- **DD-Mon-YY**: To display dates like 6-Feb-88
- **DD.MM.YY**: To display dates like 6.02.88.

The default date format depends on the country group selected when Paradox was installed. You can use the Custom Configuration Program to change the on-screen default format for dates.

In a Paradox date field, you can store values between *January 1, 100* and *December 31, 9999*. For dates not in the 20th century, the century will be added. Thus the year component of a date value may be 2, 3, or 4 digits. Some examples will show how Paradox displays dates in each format:

Date	MM/DD/YY	DD-Mon-YY	DD.MM.YY
January 1, 1099	1/01/1099	1-Jan-1099	1.01.1099
May 1, 213	5/1/213	1-May-213	1.05.213
August 21, 1988	8/21/88	21-Aug-88	21.08.88

Unless you use **KeepSet** to save the new format, it will last only while the image remains on the workspace.

Table 8-1. Number Formats

Value	Places	General	Fixed	Comma	Scientific
1234	2	1234	1234.00	1,234.00	1.23E+03
1234.0002	2	1234	1234.00	1,234.00	1.23E+03
–1234.0002	2	–1234	–1234.00	(1,234.00)	–1.23E+03
1234.567	2	1234.57	1234.57	1,234.57	1.23E+03
1234	5	1234	1234.00000	1,234.00000	1.23400E+03
1234.0002	5	1234.0002	1234.00020	1,234.00020	1.23400E+03
–1234.0002	5	–1234.0002	–1234.00020	(1,234.00020)	–1.23400E+03
1234.567	5	1234.567	1234.56700	1,234.56700	1.23456E+03

Zoom

TableSize ColumnSize Format Zoom Move PickForm KeepSet Graph
Go to a named field, record, or value in the current image.

Zoom moves the cursor to a particular field, record, or value in the current table or form. This selection saves time when you are working with large tables that contain many fields and records.

When you choose **Zoom** from the Image menu, you will see a submenu with three choices:

Field Record Value
Move to a named field.

- **Field**: To move the cursor to a particular field
- **Record**: To move the cursor to a particular record number
- **Value**: To move the cursor to a particular value in a field.

Field

Field Record Value
Move to a named field.

Zoom/Field moves the cursor to a particular field in the current table or form.

When you select **Zoom/Field**, you will see a menu of all the fields in the current table. For example:

Select a field to move to:
Stock # Description Quant Price

Select the field you want to move to. The cursor will move to that field in the current record.

Record

Field Record Value
Move to a specified record number.

Zoom/Record moves the cursor to a particular record number in the current table or form.

When you select **Zoom/Record**, Paradox will prompt:

Record Number:
Enter record number to move to.

Recall that record numbers are displayed in the leftmost column of tables on the screen. Type the record number you want to move to and press [Enter]. The cursor will move to the current field in that record.

If you know approximately where the record you want is located, **Zoom/Record** provides an easy way to find it. Look at the image status indicator in the top left corner of the screen to find out how many records are in the image. Then **Zoom** a record number halfway (or a third of the way, or two-thirds, etc.) to the end. From there you can use the cursor keys to scroll to the exact location you want.

If you have no idea at all where the record you want is located, **Zoom/Value** may be more useful.

Value

Zoom/Value moves the cursor to a specified value in the current table or form. **Zoom/Value** is a powerful way to search for a particular value in a table, even if you're not sure exactly how it is stored. You can either specify exact matches or use wild cards to construct patterns as the basis for the search. The Zoom [Ctrl][Z] and Zoom Next [Alt][Z] keys serve as shortcuts for **Zoom/Value**.

When you select **Zoom/Value**, Paradox will prompt you to move the cursor to the field you want to search in:

Use ← and → to move to the column you want to search in...
then press ↵ to select it...

Move the cursor to the column that contains the values you want to locate, then press [Enter]. Paradox will now prompt you to enter a value or pattern to look for:

Value:
Enter a value or pattern to search for.

The value you enter must be consistent with the type of field in which you are searching. The value can be up to 175 characters long. You can use Field View [Alt][F5] to edit long values in the menu. After you've entered the value to locate, press [Enter] (twice if you've used field view).

Paradox will search the current field for the specified value. Regardless of where the cursor is when you start, the initial search always begins from the first record in the table. If a match is found, the cursor moves to the first occurrence of the value. If no match is found the cursor remains in the current record.

You can search for either an exact value or use one of Paradox's **wild card operators** to construct a pattern to use in the search. As in query statements (see "Patterns" in Chapter 4), the **..** operator stands for a series of any number of characters, including no characters or blank spaces. The **@** operator stands for any single character.

For example, suppose you know a particular customer's name starts with "M" and ends with "S", but you can't remember precisely how it is spelled. You could enter **M..s** as the value to locate.

If the value you enter has no patterns, the search will be case sensitive; that is, Paradox will look for a value containing the exact string of upper and lower case characters you specify. If the value you enter includes patterns, case will be ignored.

If a match is found, you can use the Zoom Next [Alt][Z] key (described in the next section) to locate subsequent matches in the table.

The Zoom and Zoom Next Keys

[Ctrl] [Z] **Zoom**

[Alt] [Z] **Zoom Next**

You can use the Zoom [Ctrl][Z] key as a shortcut for **Zoom/Value**. To do so, place the cursor in the field in which you want to search, then press Zoom [Ctrl][Z]. You will see the **Zoom/Value** menu for the current field. If you have already entered a search key (value or pattern) for this field it will appear with the **Zoom/Value** menu. At that point you can either change the search key or press [Enter] to reuse the value.

If a match is found, either by using **Zoom/Value** or Zoom [Ctrl][Z], you can continue to search the field for subsequent occurrences of the value or pattern by pressing Zoom Next [Alt][Z]. Zoom Next [Alt][Z] resumes the search from the matched record. You can therefore use Zoom Next [Alt][Z] to search quickly through an entire table for all records that match your search value or pattern.

Using Zoom/Value and Zoom [Ctrl][Z]

Paradox maintains one search key (value or pattern) for each image displayed on the workspace. You can use this capability in a number of powerful ways. For example, you could place two images of the *customer* table on the workspace. In one image, you could set a search key on the Cust ID field; in the other, you could set a search key on Last Name. By simply moving between images and using Zoom [Ctrl][Z] and Zoom Next [Alt][Z], you can quickly locate any record by name or by ID number.

Image/Zoom/Value, Zoom [Ctrl][Z], and Zoom Next [Alt][Z] can be used while viewing, editing, or coediting tables. In addition, Zoom [Ctrl][Z] and Zoom Next [Alt][Z] can be used to locate values in a lookup table that you've set up with the **TableLookup** selection of the ValCheck menu in Edit or DataEntry modes.

Zoom [Ctrl][Z] and Zoom Next [Alt][Z] are also available in the Paradox help index. You can use them to quickly locate any topic in the index.

Move

TableSize ColumnSize Format Zoom **Move** PickForm KeepSet Graph
Move a named colum to a new position in the current image.

Sometimes you may want to change the order in which fields are displayed. For instance, you may want to see columns side by side for comparison.

To rearrange fields in an image, you may use the **Move** option or a shortcut, the Rotate [Ctrl][R] key. **Move** moves a field in the current image from one location to another. **Move** is particularly useful if you want to rearrange a table with many fields.

When you select **Move**, you will see a menu of fields in the current table. For example,

Name of field to move:
ID# Last Name Init Position Date Hired Soc Sec Salary

Select the field you want to move to. Paradox will prompt you to move the cursor to the new field position:

Now use → and ← to show the new position for the field...
then press ↵ to move it.

Move to the field you want and press [Enter]. The field will move to the location of the cursor. All other fields will be shifted automatically.

Unless you use **KeepSet** to save the new field arrangement, it will last only while the image remains on the workspace. Alternatively, you can use **Modify/Restructure** to permanently relocate the field (see Chapter 7 for more information).

Rotate

[Ctrl] [R] **Rotate**

If you want to move a field to the end (right edge) of the table, you can use a shortcut that does not use the **Image** option. Simply move the cursor to the field you want to move and press Rotate [Ctrl][R]. The current field will move to the end of the image, shifting all other fields to the left.

PickForm

TableSize ColumnSize Format Zoom Move **PickForm** KeepSet Graph
Select a form to view for the current image.

PickForm lets you choose which form to use to display the current table in form view. You can view the records on a standard form created automatically by Paradox, or on a form that you have created.

When you select **PickForm**, you will see a menu of the existing forms for the current table. For example,

F 1 3 9
Customer information form

Select the letter or number of the form you want to work with. You will see the current record displayed on that form.

Once you choose a form, it will be displayed when you press Form Toggle [F7] to switch to form view. However, unless you use **KeepSet** to save the new form selection, the selection will last only while the image remains on the workspace, or until you use **PickForm** again to choose a different form.

If you have not created custom forms for the current table, only the default form (**F**) will appear on the menu of forms. For information about creating a custom form, see Chapter 2 (Forms) of *Presenting Paradox Data*.

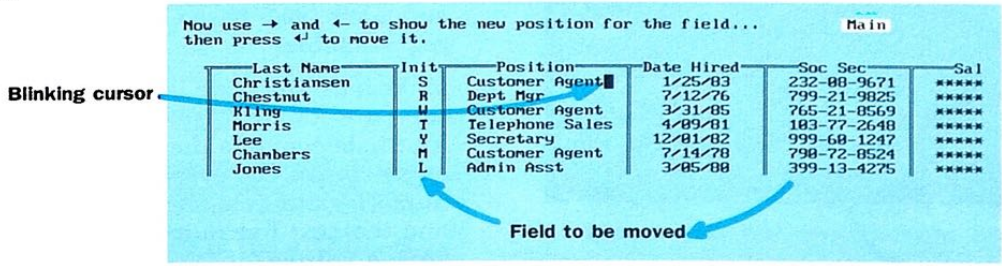
KeepSet

TableSize ColumnSize Format Zoom Move PickForm **KeepSet** Graph
Make the current image settings permanent.

KeepSet saves the current **Image** settings in a disk file (with the extension .SET). The settings saved are **ColumnSize**, **Format**, **Move**, **PickForm**, and Rotate [Ctrl][R]. The **TableSize** and **Graph** settings are not saved. Once settings are saved, they will be restored whenever the table is on the screen.

If you already have a settings file for the table, the new one will replace it.

Rearranging Fields



Graph

TableSize ColumnSize Format Zoom Move PickForm KeepSet Graph
Change, load, or save graph settings; view or output graphs; create crosstabs.

The Paradox graph system allows you to display information from your Paradox tables in a powerful visual form. Their visual impact makes graphs an important analytic interpretive tool; you can use them to draw conclusions quickly and see relationships in your data that you might otherwise miss. And because the Paradox graph system is so flexible and easy to use, you can view different kinds of graphs along the way as you work with your data. You'll find that the different perspectives that graphs offer help you to see new trends in your data and find new solutions to problems. On a network, you can even have Paradox continuously update your graph as other users change or add data to the table that you're graphing.

Ctrl **F7** **Graph**

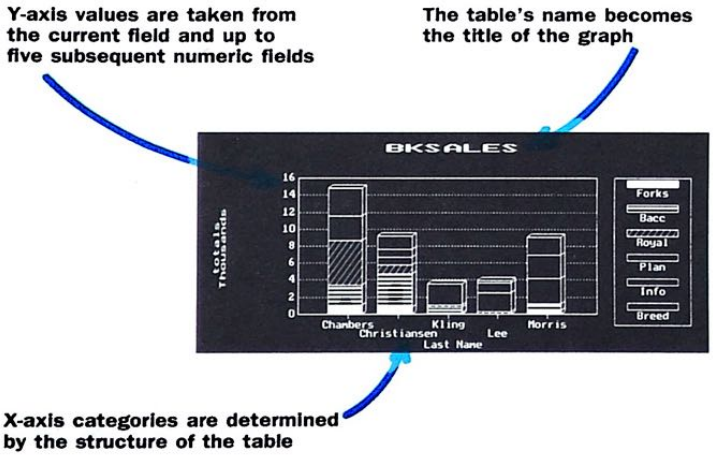
Paradox makes it easy to produce an "instant graph" of the table you're viewing. From the Main mode or the graph design subsytem, just press Graph [Ctrl][F7] and you'll see a stacked bar graph of the information in the current table. This is the standard graph that Paradox creates using the default graph settings.

Unlike instant forms and reports, instant graphs can't always present all of the information in a table. Instead, they **extract** the data to graph depending on the structure of the table and the position of the cursor. Sometimes you'll want to rearrange, query, or crosstabulate your table to select, limit, or summarize the data that Paradox graphs.

You can also customize the standard graph in many ways. You can select among 10 types of graphs, set colors and patterns, title and scale the graph and its axes, and adjust many other **graph settings** to produce just the effect you want.

Graphs are discussed in two places in the Paradox manuals.

- This chapter presents an overview of the graph design process, and describes how to use the Image/Graph menu to
  - save, load, and reset graph settings
  - summarize a table by crosstabulating it
  - view, print, or file a graph.
- *Presenting Paradox Data* contains a full discussion of the whole process of designing graphs.
  - Chapter 6 (Designing Graphs) discusses types of graphs, transformation rules for graphing tables, and preparing a table to graph. It also contains a comprehensive tutorial that takes you through the process of graphing information in the sample Paradox tables.
  - Chapter 7 (Customizing Graph Settings) contains a complete discussion of adjusting graph elements to produce just the graph you want.



Design Overview

Pressing Graph [Ctrl][F7] lets you create a standard graph of any table. You can present your data in a different form by simply rearranging the table you're graphing or by selecting a different graph type. Then, when you're familiar with the advantages of different graphs, you can adjust the graph settings to customize your graphs.

To design and display a graph, follow these steps:

1. If the data you want to graph are already contained in a table, display it on the workspace. You may want to use **Ask** or **Image/Graph/CrossTab** to create and display an appropriate summary table based on data in one or more regular tables.
2. Make sure the table is ready to graph. If necessary, use Rotate [Ctrl][R] to rotate fields until the first field contains the graph categories (the x axis values). The cursor should be in the first numeric data field. Paradox graphs that field and the next five numeric fields to its right as **series values**.

3. If you want to specify a graph other than the standard graph, select **Image/Graph/Modify**. You can change the graph type itself, or press Menu [F10] to display the Graph Design menu and change any of the other settings.

   You can use **Image/Graph/Save** to store the current graph settings in a file, or **Image/Graph/Load** to recover those settings. You can also use **Image/Graph/Reset** to restore the default settings.

4. Press Graph [Ctrl][F7] to draw the graph on your screen. You can also select **Image/Graph/View-Graph** to view, print, or file the graph.

5. When you're finished viewing the graph, press any key to return to the workspace.

The rest of this chapter describes the Image/Graph menu selections that allow you to work with graphs. The design process is described in detail in Chapters 6 (Designing Graphs) and 7 (Customizing Graph Settings) of *Presenting Paradox Data.*

The Graph Menu

```
Modify  Load  Save  Reset  CrossTab  ViewGraph
Modify the current graph specification.
```

Like forms and reports, graphs are Paradox objects. You can save, modify, and retrieve graph settings. If you have a suitable printer or plotter, you can print your graphs. You can use the selections on the Image/Graph menu to perform these tasks.

When you select **Graph** from the Image menu, you'll see a submenu with six selections:

- **Modify**: To change the settings for the current graph
- **Load**: To retrieve a graph settings file you saved earlier
- **Save**: To save the current graph settings in a file
- **Reset**: To return the graph settings to their default values
- **CrossTab**: To crosstabulate a table
- **ViewGraph**: To view, print, or plot a graph, or to save its image in a printer output file.

Modify

```
Modify  Load  Save  Reset  CrossTab  ViewGraph
Modify the current graph specification.
```

Modify lets you change all of the attributes of the current graph. When you choose it from the Graph menu, you see the GraphType form first. You can change the graph type itself, or press Menu [F10] to display the Graph Design menu and change any of the other settings:

```
Type  Overall  Series  Pies  ViewGraph  Help  DO-IT!  Cancel
Change the the currently specified graph type.
```

- **Type**: To select the type of graph to display, and to combine different graph types on one graph
- **Overall**: To define settings that affect the overall layout and look of a graph, such as those for titles, axes, and colors
- **Series**: To change the settings that affect the series elements of a graph, such as legends, labels, markers, and patterns
- **Pies**: To change the settings for pie charts
- **ViewGraph:** To view, print, or plot the current graph, or save it to a printer output file
- **Help**: To get on-screen help about graphs
- **Do-It!:** To accept the current graph settings and return to the workspace (same as pressing DO-IT! [F2])
- **Cancel**: To return to the workspace without accepting the current changes.

Changes you make to the graph settings with **Image/Graph/Modify** are temporary. They remain in effect until you change them again, or until you end the current Paradox session. However, you can use **Image/Graph/Save** to save them in a graph file, and **Image/Graph/Load** to retrieve them.

You can change the default settings for the standard graph, by using the Custom Configuration Program as described in Chapter 14 (Advanced Topics) of this book. For a detailed discussion of each of the options on the Graph Design menu, see Chapter 7 (Customizing Graph Settings) of *Presenting Paradox Data.*

Load

```
Modify  Load  Save  Reset  CrossTab  ViewGraph
Load a stored graph specification.
```

If you have used **Image/Graph/Save** to save the graph settings from another graph, you can use **Load** to retrieve them. Paradox asks which settings file you want to load.

```
Graph:
Enter name of graph to load.
```

Type the graph file name or press [Enter] and select it from a menu. You don't have to type the .g extension.

When you load a graph file, its settings become active immediately. You can select **Image/Graph/**

ViewGraph/Screen or press Graph [Ctrl][F7] to see the current graph.

You can also use **Image/Graph/Modify** to further customize the settings you've retrieved. This lets you use settings files as templates. For example, if you produce the same set of graphs every month, you could save all the constant settings in a file. Then you could quickly produce your graphs each month by simply altering the main titles to reflect the current month.

Save

Modify Load Save Reset CrossTab ViewGraph
Save the current graph specification.

Normally the current graph settings are lost when you change them or leave Paradox. However, at any time you can save the current settings in a file so you can use them again later. Paradox saves all of the settings on the Graph Design menu, including the graph type, titles, axes, and colors.

To save a file, select **Image/Graph/Save**. Paradox prompts you for a file name.

Graph:
Enter name of graph file in which to save the current specification.

Graph setting names, like table names, can be up to eight characters long. If you enter a name that already exists, you'll have a chance to cancel or replace it.

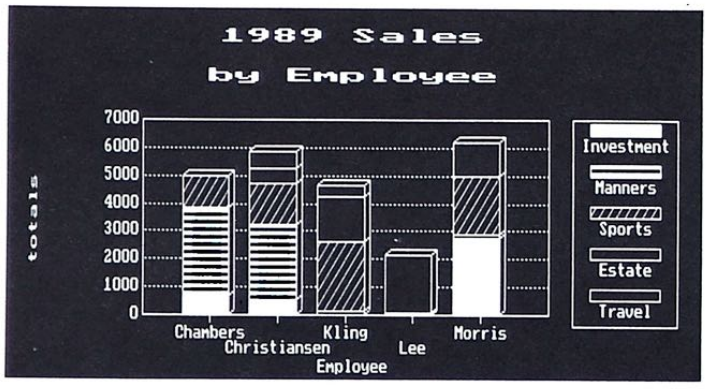
▶ **Note:** When you use **Image/Graph/Save**, you are saving the graph settings to a file. To save an image of the graph itself, use **Image/ViewGraph/File** (explained later in this chapter).

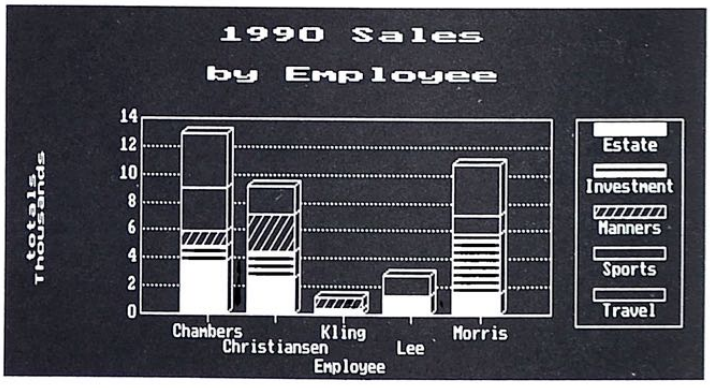
Reset

Modify Load Save Reset Crosstab ViewGraph
Reset the graph specification to the default settings.

Selecting **Reset** from the Image/Graph menu returns all graph settings to their default values. You may want to use this option when you

These graphs use almost identical graph settings. Only the titles and data are different





- aren't satisfied with your current settings and want to start over
- want to return to the standard graph
- want to graph a different table to which the current settings don't apply.

Reset is different from the **Cancel** option on the Graph Design menu. **Cancel** returns you to the graph settings that were in effect before your most recent changes. **Reset** always returns you to the default settings as they are defined in the Custom Configuration Program, or (if you haven't defined them in the CCP) to Paradox's original defaults.

For more information about the default graph settings, see Chapter 7 (Customizing Graph Settings) of *Presenting Paradox Data*. For more information about the Custom Configuration Program, see Chapter 14 (Advanced Topics).

CrossTab

Modify Load Save Reset CrossTab ViewGraph
Produce a cross-tabulated CROSSTAB table from the current image.

Selecting **CrossTab** from the Image/Graph menu, or pressing CrossTab [Alt][X], transforms the current table into a new *crosstab* table suitable for graphing and analysis. As explained later in this section, the menu selection offers a few more options than the key.

In essence, **CrossTab** converts data from the normalized form of a relational database like Paradox to a spreadsheet-like structure. The crosstabulation allows you to analyze your data by two factors like sales by product per month, or orders per customer per year., which are listed down the left side and across the top of the *crosstab* table. You select the values to crosstabulate, and the two factors, by choosing fields from the original table.

The table in Example 8-1 is called a **summary** *crosstab* table because its entries contain the **sums** of the values in the original tables. When you use **CrossTab**, you can also create *crosstab* tables based on the count, maximum, or minimum values. You automatically get a summary table when you use CrossTab [Alt][X].

The information in *crosstab* is taken from three columns in the original table:

- The **row labels**, listed down the left side of *crosstab*, are taken from the Name field. *Crosstab* is keyed on the row label field. Notice

8-1. A Summary Crosstab

Suppose you have a Paradox table that shows the names of salespeople, the items they've sold, and the price of the items.

Suppose you want to know each employee's total sales of each type of item. If you look carefully at this table, you can see that John sold two tents worth a total of $420, Madeleine sold one tent for $325 and two heaters for a total of $170, and Mark sold three stoves for a total of $227.

You can use **Image/Graph/CrossTab** to total these figures for you. The sales figures are the data to analyze, and the names of employees and items are the factors by which you want to organize them. A crosstabulation of the sum of the sales values in the camping table would look like this:

When you use **CrossTab**, *crosstab* becomes the current table. The cursor will be in the first numeric column so that you can display a standard graph

CAMPING	Name	Item	Price
1	John	Tent	245.00
2	Mark	Stove	59.00
3	Madeleine	Heater	75.00
4	Mark	Stove	79.00
5	Madeleine	Heater	95.00
6	Madeleine	Tent	325.00
7	John	Tent	175.00
8	Mark	Stove	89.00

Row labels taken from Name field

Column labels taken from Item field

Values calculated from Price field

CROSSTAB	Name	Tent	Stove	Heater
1	John	420.00	0.00	0.00
2	Madeleine	325.00	0.00	170.00
3	Mark	0.00	227.00	0.00

Zeros automatically inserted

of your data just by pressing Graph [Ctrl][F7]. This reflects how useful **CrossTab** is as a tool for graphing. The data in most tables need to be aggregated and summarized before they can be effectively graphed, and **CrossTab** gives you a powerful tool for just this kind of manipulation.

that, unlike the original table, each name appears only once in *crosstab*.

- The **column labels**, listed across the top of *crosstab*, are taken from the Item field. Thus, the values in this field become field names in *crosstab*.
- The **values**—the figures in the grid—are calculated from the Price field. They may be sums, counts, maximums, or minimums.

These are the three fields that Paradox always needs to identify to create a *crosstab* table from the current table. You can choose them by responding to the prompts when you select **Image/Graph/CrossTab**, or let Paradox determine them automatically, based on the position of the cursor and the order of the fields, when you press CrossTab [Alt][X]. See "The CrossTab Key" later in this section for details on CrossTab [Alt][X].

Crosstab is a temporary table like *answer*. It will be overwritten by a new *crosstab* table the next time you perform a crosstabulation, and deleted when you leave Paradox. If you want to save a *crosstab* table, use **Tools/Rename** to rename it. For more information about temporary tables, see "Paradox Objects" in Chapter 2 (Fundamentals) of this manual.

In addition to the examples in this section, you'll find many examples of crosstabulation in the "Graph Tutorial" in Chapter 6 (Designing Graphs) of *Presenting Paradox Data*.

Generating a Crosstab Table

Paradox always generates the *crosstab* table from the current table. Therefore, you should start by making sure all the information is in one table. If it's scattered among several tables, use a query to combine them into an *answer* table.

When you select **CrossTab** from the Image/Graph menu, Paradox

- lets you select a summary calculation
- guides you through the selection of the row label, column label, and value field.

After you select the value field, Paradox generates the *crosstab* table. At any point until you select the value field, you can change your mind by using [Esc] to cancel your choice.

Selecting a Summary Calculation When you select **CrossTab** from the Image/Graph menu, you can choose one of four different kinds of *crosstab* tables:

```
1) Sum   2) Min   3) Max   4) Count
Generate a crosstab using based on the sum of the values in the table.
```

- **1) Sum**: Each entry in *crosstab* contains the total of the values for its row and column pair. In Example 8-2, this is the total quantity of each book sold by each employee.
- **2) Min**: Each entry in *crosstab* contains the smallest value for its row and column labels. In Example 8-2, this would be the smallest order for each book sold by each employee.
- **3) Max**: Each entry in *crosstab* contains the largest value for its row and column labels. In Example 8-2, this would be the largest order for each book sold by each employee.
- **4) Count**: Each entry in *crosstab* contains the number of records for its row and column labels. In Example 8-2, this would be the number of orders taken for each type of book by each employee (not the total number sold).

In Example 8-2, **1)Sum** was selected in order to total the values in the Quantity field. In Example 8-3, **3) Max** and **4) Count** were selected

Choosing the Fields After you choose a summary calculation, Paradox asks you to choose the fields in the current table that will be the row labels, column labels, and values of *crosstab*:

```
Use → and ← to move to the column containing the crosstab values...
then press ↵ to generate the crosstab.
```

The fields you select, and their order in the original table, determine what the *crosstab* table looks like.

- The data in the field you select for the row labels will be listed down the left side of the *crosstab* table. This field also becomes the *crosstab* table key, which determines the order of the records.

  If there are any fields to the left of the row labels field, they will also be included in *crosstab* (and in the key) in the same order as in the original table. This lets you control the order of the rows in the *crosstab* table, or base the rows on more than one field, as shown in Example 8-4. You can use **Image/Move** or Rotate [Ctrl][R] to rearrange the fields to create the key you need.

  For example, if you want only one field to be included in the key, rotate it to the far left of the current image before selecting **Image/Graph/CrossTab**. If you are crosstabulating an *answer* table, you can also construct your query to position the row labels field correctly, as illustrated in Example 8-2.

- The field you select for the column labels, which will be listed across the top of the *crosstab* table, must be to the right of the row labels field.
- The field you select for the values, which will be summarized in the grid formed by the other two fields, must be numeric.

  If there are no data for a given column and row, the field in *crosstab* is
  - zero for **1) Sum** and **4) Count**
  - left blank for **2) Min** and **3) Max**.

In Examples 8-2 and 8-3, for instance, Christiansen has sold no *Auctn* books. The cell value is 0 when *crosstab* reflects the sum or count of the values, blank when it reflects the maximum.

- All other fields in the current table are ignored.

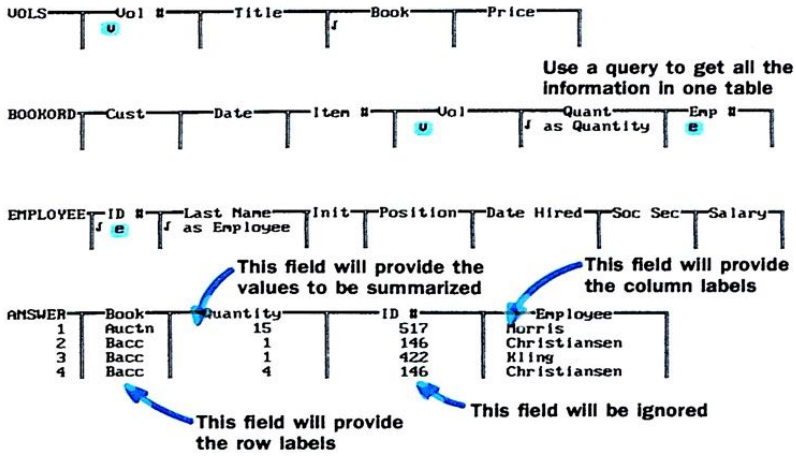
8-2. Generating a Summary *Crosstab* Table

Suppose you want to know what kinds of book club titles each employee is selling. In other words, you want to summarize the total quantity of each type of book sold by each employee.

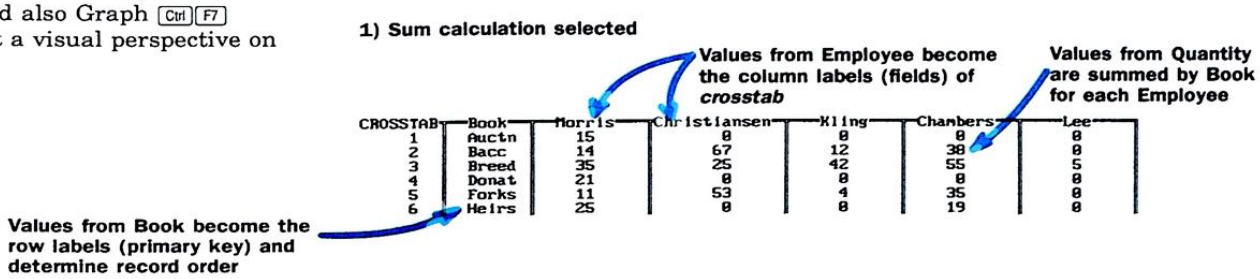
All the information you need is contained in the sample *bookord* table, but salespeople and book titles are indicated by code numbers there. You can use example elements to link *bookord* to *employee* and *vols* and display the names that correspond to the code numbers. Then you can crosstabulate *answer* to get an analysis of each salesperson's performance.

We've put the *vols* query first so that Book is the first field in the *answer*. This will make it easier to list the book titles down the left side of *crosstab*. See "Choosing the Fields" later in this section for details.

Once you have all the information in one table, you can use **Image/ Graph/CrossTab** to crosstabulate it. The resulting *crosstab* table shows how many of each type of book were sold by each employee. The data from *answer* are summarized and reorganized into a form that is easier to analyze. At this point you could also Graph Ctrl F7 *crosstab* to get a visual perspective on your data.



1) Sum calculation selected



8-3. Max and Count *Crosstab* Tables

These two *crosstab* tables were generated from the same *answer* table as Example 8-2, but **3) Max** and **4) Count** were selected as the summary calculations. The first table shows the largest order taken for each type of book by each employee; the second shows the number of orders taken.

3) Max calculation selected

Values are largest order for each type of book by employee

CROSSTAB	Book	Morris	Christiansen	Kling	Chambers	Lee
1	Auctn	15				
2	Bacc	14	25	11	23	
3	Breed	23	25	22	31	5
4	Donat	21				
5	Forks	7	28	3	35	
6	Heirs	25			19	

Column and row labels are the same

4) Count calculation selected

CROSSTAB	Book	Morris	Christiansen	Kling	Chambers	Lee
1	Auctn	1	0	0	0	0
2	Bacc	1	6	2	2	0
3	Breed	2	1	2	3	1
4	Donat	1	0	0	0	0
5	Forks	2	3	2	1	0
6	Heirs	1	0	0	1	0
7	Help	0	2	0	2	2

Values are the number of orders for each type of book by employee

8-4. Ordering the Row Labels Field

Suppose the field you select for the row labels contains the names of the months. Since that's also the key for the *crosstab* table, the Month field will be sorted alphabetically, so the record for April will come before February, then January, March, and so on.

If you want to keep the months in chronological order, add a new MonthOrder field to the left of the field containing the month names, like this:

As the leftmost field, MonthOrder becomes the first field in the key of the *crosstab* table, which is used to determine the order of records. So, when you select Month as the row label field, Paradox sorts the records in *crosstab* by MonthOrder and keeps the months in chronological order.

Select this field for the row labels

SALES98	MonthOrder	Month	I
1	3	March	
2	4	April	
3	3	March	
4	1	January	
5	2	February	
6	2	February	
7	4	April	
8	5	May	
9	1	January	

This field will precede the Month field and sort chronologically

CROSSTAB	MonthOrder	Month	I
1	1	January	
2	2	February	
3	3	March	
4	4	April	
5	5	May	

The CrossTab Key

Alt **X** **CrossTab**

When you need a summary *crosstab* table to analyze or graph your data, you can quickly create one by pressing CrossTab [Alt][X]. Instead of prompting you to select the row labels, column labels and values, Paradox "assumes" your choices from the positions of the fields and cursor in the current table. You can Rotate ([Ctrl][R]) fields in the current table, or use **Image/Move**, or—as shown in Example 8-2—organize the tables in your query to produce the order of fields you want in *answer*.

When you press CrossTab [Alt][X]:

- The data in the current field (the one the cursor is in) and all fields to its left become the **row labels**. They also become the key of the resulting *crosstab* table.
- The data in the next-to-last (i.e., the second from the right) field become the **column labels**.
- The data in the last (rightmost) field become the **values**, which are summed for every row and column.
- All other fields are ignored.

Using CrossTab [Alt][X] can sometimes be much faster than selecting **Image/Graph/CrossTab** and responding to the prompts.

Crosstabs on a Network

If you are working with a shared table on a network, Paradox takes a "snapshot" of the values in the table when you press CrossTab [Alt][X] or select one of the **CrossTab** options from the menu. (To speed processing, the snapshot is not taken if no one else is using the table, or if you are crosstabulating a private table like *answer*.) This lets you use **CrossTab** while other users are viewing or even modifying the records in the same table.

If another user happens to be modifying the table while the snapshot is being taken, Paradox keeps trying to take the snapshot again until it is successful. You'll see a message each time Paradox tries to complete the crosstab. If you want to cancel the automatic retries, press [Ctrl][Break].

8-5. Using Crosstab [Alt][X]

You can use CrossTab [Alt][X] to quickly produce the summary crosstab table Example 8-2 by just rotating one field in *answer*. With the cursor in Quantity, press Rotate [Ctrl][R] once to move it to the end of the table. Now move the cursor to the row label field (Book) and press CrossTab [Alt][X] to crosstabulate the table.

1) Sum calculation is assumed

Press Rotate [Ctrl][R] to move this field to the end

ANSWER	Book	Quantity	ID #	Employee
1	Auctn	15_	517	Morris
2	Bacc	1	146	Christiansen
3	Bacc	1	422	Kling

Move the cursor here and press Crosstab [Alt][X]

ANSWER	Book	ID #	Employee	Quantity
1	Auctn	517	Morris	15
2	Bacc	146	Christiansen	1
3	Bacc	422	Kling	1

Row labels taken from current field

Column labels taken from next-to-last field

Values calculated from last field

CROSSTAB	Book	Morris	Christiansen	Kling	Chambers	Lee
1	Auctn	15	0	0	0	0
2	Bacc	14	67	12	38	0
3	Breed	35	25	42	55	5
4	Donat	21	0	0	0	0

ViewGraph

Modify Load Save Reset Crosstab ViewGraph
Construct a graph for the current image.

ViewGraph displays a graph of the current table on the screen, or sends it to a printer, plotter, or file on disk. The current graph settings are used.

For convenience, **ViewGraph** occurs in two places in the Graph menu structure: on the Image/Graph menu, and on the Graph Design menu. It doesn't matter which one you choose; the effect is the same. This double placement makes it easy for you to see your graphs as you are modifying them, or as information in the tables changes.

When you select **ViewGraph**, you'll see a submenu of the three places you can send a graph of the current table:

Screen Printer File
Display the graph on the screen.

- **Screen**: To view the graph on the screen (same as pressing Graph [Ctrl][F7])
- **Printer**: To output a graph to the active printer or plotter
- **File**: To save an image of the graph in a printer output file on disk.
  - **Note**: To save the current **graph settings** instead of an image of the graph itself, use **Image/Graph/Save** instead of **ViewGraph/File.**

Screen

Screen Printer File
Display the graph on the screen.

To show the current graph on the screen, select **Screen** from the Image/Graph/ViewGraph menu. This is the default setting, and has the same effect as pressing Graph [Ctrl][F7].

Printer

Screen Printer File
Send the graph to a printer.

Printer sends the current graph to the active printer or plotter.

Before selecting **Printer** from the Image/Graph/ViewGraph menu, make sure the printer or plotter you want is defined in the Paradox Custom Configuration Program (as described in Chapter 14 of this book). If the device you want is not the default, you can make it active by choosing **Image/Graph/Modify**, then pressing Menu [F10] and choosing **Overall/Device/Printer** from the Graph Design menu. For details, see Chapter 7 (Customizing Graph Settings) of *Presenting Paradox Data*.

File

Screen Printer File
Send the graph output to a DOS file on disk.

File stores an image of the current graph in a printer output file on disk. You can print it later, or use your word processing or desktop publishing program to embed it in a larger document.

When you select **File** from the Image/Graph/ViewGraph menu, Paradox asks for a file name:

File Name:
Enter the name to be given to the file

By default, the file is saved in whichever format is appropriate to the currently selected printer. You can select a different format by choosing **Image/Graph/Modify**, then pressing Menu [F10] and choosing **Overall/Device/File** from the Graph Design menu. You can save the file in Encapsulated PostScript (EPS) or PIC format, or formatted for the active printer. For details, see Chapter 7 (Customizing Graph Settings) of *Presenting Paradox Data*.

- **Note:** When you use **Image/ViewGraph/File**, you are storing the **actual image** of the file on your disk, which you can then process with other graphics applications. To save the **graph settings** on disk, use **Image/Graph/Save** (explained earlier in this chapter).

Graphs on a Network

To graph a table, you must first be able to view it. Viewing a table places a Prevent Full Lock on it, so if another user has begun an operation that requires the exclusive use of the table, you won't be able to graph it. However, many of your graphs will be based on an *answer* or *crosstab* table which are private and cannot be locked by other users.

You can use recorded scripts and **Scripts/RepeatPlay** to create an **autoregraph** system that updates a graph continuously on your screen. For details, see Chapter 11 (Scripts) of this manual, and also "Using Scripts with Graphs" in Chapter 6 (Designing Graphs) of *Presenting Paradox Data*.

Chapter 9

Forms

View Ask Report Create Modify Image **Forms** Scripts Tools Help Exit
Design or change a form.

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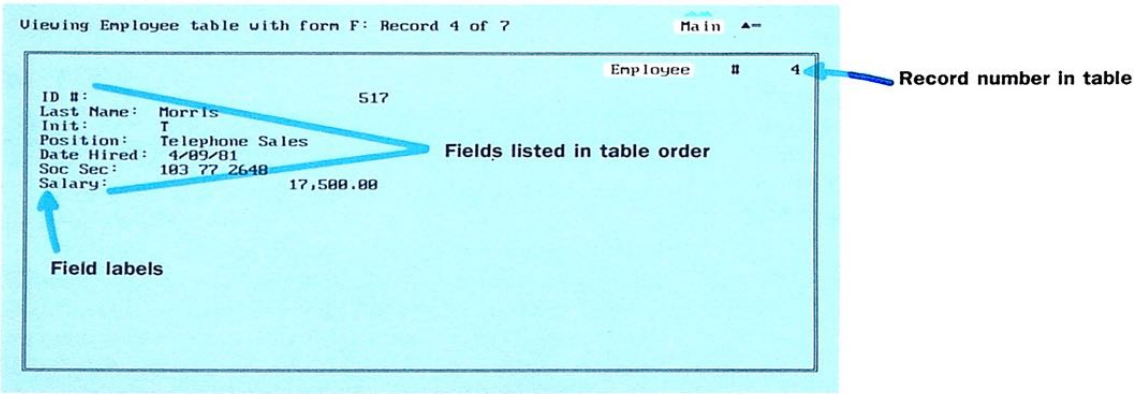
Tables and Forms

Selecting **Forms** from the Main menu lets you design or change Paradox custom forms. You use forms to display or edit information in a table. A form can display either one or several records at a time. While viewing or editing records, you can press Form Toggle [F7] at any time to switch between table and form view. The major differences between an image in table view and form view are:

- A table image can show many records at one time, while a form can show either one or many records at a time.
- A table image can show only a limited number of fields at one time, while a form can show many.
- A table image can exceed the width of the monitor screen, while a form can be no wider than the screen. You can scroll a table horizontally and vertically, but you can scroll a form only vertically.
- A form can have **calculated fields** that aren't actually in the table.
- A form can have **wrapped fields** which show the information in a single field on two or more lines.
- The information in a table image is always arranged in rows and columns, whereas the information on a form can be arranged in many different ways.
- One form can be embedded on another form, and each form behaves as a distinct image on the screen. Forms that contain embedded forms display data from more than one table, have special capabilities described in Chapter 2 (Designing Forms) of *Presenting Paradox Data*.

A standard form



Types of Forms

When you press Form Toggle [F7], you will see the **preferred form** for the current table. This is form **F**, unless you have selected **Image/Pickform** to indicate that a different form is preferred. Unless you have changed it, **F** is a **standard form** that Paradox has created automatically. The standard form for the sample *employee* table is shown in the figure.

On a standard form, each field in the table is shown on a separate line, preceded by its field name. The record number is shown in the top right corner. If the table has more than 22 fields, each group of 22 fields makes up a separate page of the form. A form may have up to 15 pages. When a form is displayed on the screen, you can use the cursor keys to move the cursor from field to field, page to page, and record to record. For details, see "The Keyboard" (especially the foldout diagram) in Chapter 2 (Fundamentals) of this book.

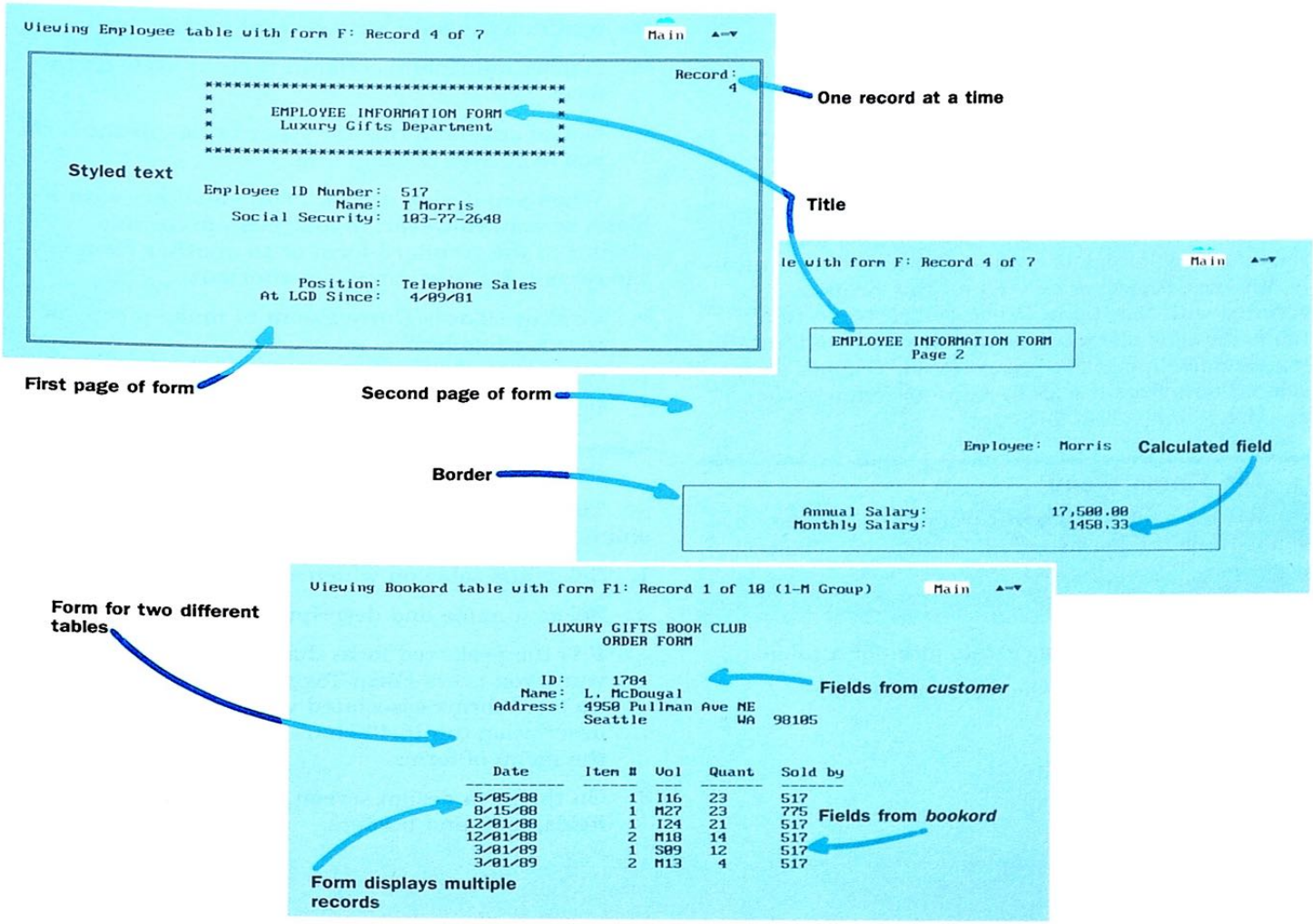
When the layout of the standard form does not meet your needs, you can use **Forms/Design** to design a **custom form** that does. Each Paradox table can have up to 15 custom forms.

A custom form is a powerful, visually interactive way to enter and display information. For instance, if your personnel staff is comfortable working with a particular printed employee information form, you can design and display on the screen a Paradox custom form that looks just like the printed form.

Custom forms have many different applications and purposes. Here are a few:

- When you make a sale, you can enter the order on a custom order form.

Custom Forms



- You can display the records in the *sales* table on a custom invoice form. You can include an additional field that calculates the total amount due, including sales tax.
- You can display selected records in a *payables* table on a custom form designed to look like checks.
- Each month, you can query your *orders* and *quotas* tables to produce a table containing each sales representative's quotas and actual sales for the past three months, as well as the quota and projected volume for the current month. You can then display each rep's record on a custom performance report form.

You can also use custom forms as input/output screens in a PAL (Paradox Application Language) program, or in an application you create using the Paradox Personal Programmer. For details, see the *PAL User's Guide* and the *Guide to the Paradox Personal Programmer*.

Once you've designed a form, you can use **Image/Pickform** to temporarily or permanently make it the preferred form, which is the one displayed when you press Form Toggle [F7]. You can also use **Forms/Change** to revise the form.

Because they are Paradox objects, forms are automatically maintained and updated along with the other objects in a table's family. When you rename, copy, or delete a table, Paradox automatically renames, copies, or delete's all the forms associated with that table. When you restructure a table, Paradox restructures the forms as well, retaining as much information as possible. You can also select **Tools** from the Main menu to rename, copy, and delete individual forms.

The Forms Menu

When you choose **Forms** from the Main menu, you will see the Forms menu. It offers two choices:

Design Change
Design a new form for a table.

- **Design**: To design a custom form for a table
- **Change**: To change or redesign a form.

Design

Design Change
Design a new form for a table.

Selecting **Design** from the Forms menu lets you design a custom form for a Paradox table, arranging the information in any way you want. For instance, you can

- choose which fields to display
- include calculated fields
- include instructions and messages
- wrap field values onto two or more lines
- highlight information with several styles of emphasis
- draw boxes around fields or text and place lines and borders around the form
- continue the form onto several pages
- display multiple records in tabular style on the form
- embed custom forms for other tables in the form you're currently designing.

When you design a new form, you start with a blank screen. However, if your custom form is similar to the standard form or to another form for the same table, you can use a shortcut:

- First use **Tools/Copy/Form** to make a copy of the existing form.
- Then use **Forms/Change** to modify the copy so that it looks like the form you want.

Design Overview

To design a custom form, select **Forms/Design** and follow these steps:

1. Select the table on which the form is to be based.
2. Select a name and description for the form.

   F is the preferred form that is normally shown when you press Form Toggle [F7]. You can have up to 15 forms associated with every table. The description (up to 40 characters) will appear on the menu of forms.
3. On the form design screen, place and arrange fields, text, and borders.

You can use the cursor keys to move around the form, and type directly on it. You can also press Menu [F10] and select options from the Form menu to place fields and borders, style text, and color the form.

4. Save the form.

When you've finished designing the form, press Do-It! [F2] or select **DO-IT!** from the Forms menu to save the form on disk. Then you can use **Image/PickForm** to make your new form the preferred form for the table. It will then appear when the table is current and you press Form Toggle [F7].

When you design a multitable form, you'll follow these steps several times, then simply embed some of the forms into others.

For complete details about designing forms, see Chapter 2 (Designing Forms) of *Presenting Paradox Data*.

Change

```
Design  Change
Modify an existing form.
```

Change lets you alter or edit a form you have created. When you select it from the Forms menu, Paradox will ask which table the form is for.

```
Table:
Enter table name form is for, or press ↵ to see a list of tables
```

Type the table name and press [Enter], or select the table from a menu as described under "Menus and Prompts" in Chapter 2 (Fundamentals) of this manual.

Next you will see a menu of forms available for the table you chose. For example,

```
F  1  4  5
Standard Form
```

The description that appears when each form number is highlighted is the one you entered when you designed the form. **F** stands for the preferred form, usually Paradox's standard form (unless you have modified it).

Next you'll see the prompt for a description of the form. The current description will already be filled in. For example,

```
Description: Employee Information Form
Enter new description for form, or press ↵ to leave unchanged
```

You can press [Enter] to keep the existing description, or you can change it.

Finally, the form itself will appear on the screen. From this point, changing it is exactly the same as designing it in the first place. You can type and edit anything on the form, or use the selections on the Forms menu to place fields, add, erase, or move form features, and style text.

```
Field  Area  Border  Page  Style  Help  DO-IT!  Cancel
Place, erase, format, recalculate, or wrap a field.
```

Forms on a Network

While you are designing or changing a form on a network, Paradox automatically places a prevent full lock on the table on which the form is based. This is the least restrictive type of lock and allows for maximum concurrent use of the table. Paradox also places a full lock on the form you are working with to prevent others from simultaneously using the form in any way. However, they may still work with the table on which the form is based.

If another user is already performing an operation that has placed a full lock on the table (such as emptying or restructuring it), you will have to wait until the operation is finished and the lock is released before working with the form.

If another user is changing a form, you will not be able to access it for any reason until he or she has finished making changes.

On a network, the owner of a table may restrict access to that table's forms. In this case, you must present a password granting you sufficient rights to the table before designing or changing its forms.

If you're coediting a table through a multitable form, other users who want to coedit the table must do so through the same form.

Tools

View Ask Report Create Modify Image Forms **Tools** Scripts Help Exit
Rename, speedup queries, convert data, copy, delete, info, net, more.

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- Renaming on a Network 190

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The **Tools** selection is used to manage your Paradox database. Its options can help you control your tables and other Paradox objects, maximizing the efficiency, usability, and security of your data.

```
Rename  QuerySpeedup  ExportImport  Copy  Delete  Info  Net  More
Rename a table, custom form, report, or script.
```

When you choose **Tools** from the Main menu, you will see the Tools menu, which contains eight choices:

- **Rename**: To change the name of a table, form, report, graph, or script
- **QuerySpeedup**: To speed up queries you use frequently by creating secondary indexes for your tables
- **ExportImport**: To transfer information to or from other computer programs
- **Copy**: To make a copy of a table, form, report, graph, script, or table family
- **Delete**: To remove a table, form, report, script, graph, query-speedup index, or other object from your database
- **Info**: To list the structure, family, or locks on a table, or the names of the tables, scripts, or files on a disk or the users on a network
- **Net**: To lock or unlock tables or set your private directory, user name, or automatic refresh interval
- **More**: To display a submenu with eight additional choices:
  - **Add**: To add records from one table to another
  - **MultiAdd**: To add records from one table to two or more tables
  - **FormAdd**: To add records from one set of related tables to another through a mutltitable form
  - **Subtract**: To remove records that are in one table from another
  - **Empty**: To remove all the records from a table
  - **Protect**: To protect tables or scripts from unauthorized access or unintentional changes
  - **Directory**: To change the Paradox working directory
  - **ToDOS**: To temporarily suspend Paradox and return to DOS.

Rename

```
Rename  QuerySpeedup  ExportImport  Copy  Delete  Info  Net  More
Rename a table, custom form, report, script, or graph.
```

Rename lets you change the name of a table, form, report, script, or graph. Although you may rename any Paradox object whenever you wish, you will probably use **Rename** most often to rename *answer* tables containing query results. (If you do not rename an *answer* table, it will overwritten by the next query, or deleted when you leave Paradox.)

When you choose **Rename**, Paradox will ask what kind of object you want to rename:

```
Table  Form  Report  Script  Graph
Rename a table and its family of forms, reports, and indexes.
```

- **Table**: To rename a table and its family of forms, reports, indexes, and other objects
- **Form**: To rename a form
- **Report**: To rename a report
- **Script**: To rename a script
- **Graph**: To rename a graph setting file.

Depending on the type of object you select, Paradox will prompt or show a menu for the current and new names. For a form, for example, it will first ask which table the form is for.

```
Table:
Enter name of table with form to rename, or press ↵ for a list of tables.
```

Type the table name or press [Enter] and select it from a menu.

Next Paradox will show a menu of existing forms for that table, followed by a menu of possible names for the form:

```
F  1  2  3  4  5  6  7  8  9  10  11  12  13  14
Standard Form
```

When you have entered or selected the current and new names, Paradox will rename the object. However, if there is already an object with the name you've chosen, you will have a chance to confirm or cancel.

Renaming on a Network

When you use **Tools/Rename** on a network, Paradox automatically places a full lock on both the source and target object. This means that other users cannot work with them in any way until the object is renamed. If anyone else on the network is using either object in any way, you won't be able to perform the rename until that user has finished.

QuerySpeedup

Rename QuerySpeedup ExportImport Copy Delete Info Net More
Speed up queries like the one on the workspace.

QuerySpeedup lets you enhance the speed of queries. If you perform a specific query frequently—for example, if you compile a weekly list of past-due accounts from a large table of receivables—then you will want to use **QuerySpeedup** to reduce the time it takes to process it.

When you choose **QuerySpeedup**, Paradox builds a **secondary index** for each non-key field in the current query in which a selection criterion is entered. (If a table is keyed, Paradox already maintains a **primary index** on the table's key fields.) The indexes help Paradox access the information in the indexed fields. See Chapter 14 (Advanced Topics) for details about primary and secondary indexes in Paradox.

For example, since the query of past-due accounts would search for records on the basis of due date, Paradox would build a secondary index on this field. The index could increase the speed and efficiency of future queries that search for due dates.

Secondary indexes are valuable, then, because they give rapid access to non-key fields of a table. Through the Custom Configuration Program, you can specify whether you want secondary indexes to be **incrementally maintained** (that is, updated each time the data in the table are changed; this capability exists only for keyed tables) or updated only when they are needed in processing a query. See Chapter 14 (Advanced Topics) for details.

Before selecting **QuerySpeedup**, make sure the query statement you want to enhance is displayed on the workspace. When you select **QuerySpeedup** from the Tools menu, you will see the message **Processing query speeedup** as Paradox builds the secondary indexes. From that point on, the indexes will be used and updated automatically.

You may wonder why you shouldn't select **QuerySpeedup** for every query, or why Paradox doesn't automatically keep secondary indexes for every field in every table. The reason is that indexes occupy disk space and take time to update. Also, it may not be helpful to create indexes for fields that contain many duplicate values, or for queries that take less time to execute than it would take to update the index.

Similarly, since key fields in a table are already indexed, it's not useful to use **QuerySpeedup** on a query that selects records on the basis of key fields only. If you do so, you'll see the message **No speedup possible**.

QuerySpeedup gives you the **option**, then, to speed up those queries that are most helped by it. Feel free to experiment. You can use **Tools/Delete** to remove all the secondary indexes for a table and start again from scratch.

QuerySpeedup on a Network

To use **QuerySpeedup**, you must have the query statement you want to speed up placed on the workspace. When you place the query forms on the workspace, Paradox will automatically apply a prevent full lock to the tables involved. As it does when you press Do-It! [F2] to process a query, when you select **Tools/QuerySpeedup** on a network, Paradox takes a "snapshot" of the records involved in the query; it uses the snapshot to construct secondary indexes.

If another user changes any of the records involved in the index during the time the snapshot is being taken, Paradox automatically tries to take the snapshot again; the automatic retries will continue until Paradox is able to take a complete snapshot. A message will inform you about the automatic retries; you can cancel them by pressing [Ctrl][Break].

ExportImport

Rename QuerySpeedup ExportImport Copy Delete Info Net More
Export to or import from other file formats.

Most data management and spreadsheet programs, including Paradox, store data in special formats that are not directly compatible with each other. Because of this, **ExportImport** is one of Paradox's most useful features. It lets you transfer data easily and freely between Paradox and other computer programs. There's no need to re-enter the data or reconstruct your database. Paradox does almost everything automatically—you don't even need to remember file names since the program will list them in a menu!

There are many reasons to import data from, or export data to, other programs. For example, you might want to

- export a Paradox table into a spreadsheet program such as Quattro, Lotus 1-2-3, or Symphony
- change your Paradox tables into Reflex database files
- change your dBase files into Paradox tables
- convert a Paradox mailing list into Ascii format and use it with a mail-merge program.

You can use **ExportImport** to convert data between Paradox and these formats:

- Quattro
- Lotus 1-2-3 (1A and 2.0) or Symphony (1.0 and 1.1)
- Reflex (1.0 and 1.1)
- dBase II, III, and III Plus
- pfs:file
- VisiCalc (DIF)
- Ascii.

When yu choose **ExportImport** from the Tools menu, you will see two optons:

Export Import
Convert from Paradox format to another file format.

- **Export**: To convert information from Paradox into other formats
- **Import**: To convert information from other programs into Paradox format.

Export

Export Import
Convert from Paradox format to another file format.

Export lets you convert Paradox tables into other program formats. You can only export tables into **new** data files, not into existing ones.

When you choose **Export** from the Tools/Export-Import menu, Paradox will ask which format to export the table to:

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a .WKQ file.

- **Quattro**: To export to a Borland Quattro .WKQ file
- **1-2-3**: To export to a Lotus 1-2-3 .WKS or .WK1 **file**
- **Symphony**: To export to a Lotus Symphony .WRK or .WR1 file
- **DBase**: To export to a dBase II, III, or III Plus .DBF file (Paradox will ask which one you want)
- **Pfs**: To export to a pfs:file or IBM Filing Assistant .PFS file
- **Reflex**: To export to a Borland Reflex (Release 1.0 or 1.1) .RXD file
- **VisiCalc**: To export to a VisiCalc or other .DIF file
- **Ascii**: To export to an Ascii .TXT file (Paradox will ask whether it should be delimited or not).

Name:
Enter name of table to export, or press ↵ to see a list of tables.

Type the table name or press [Enter] and select it from a menu. Finally, Paradox will ask you to name the exported file.

File name:
Enter name to be given to converted file.

Type the new file name and press [Enter]. As usual, you may preface the file name with a drive or directory name. There is no need to type the file extension (like .WKS or .TXT), although you may add one if you wish.

When you've entered the new file name, Paradox will export the table into a data file with the format you have chosen. You will see a status report of the progress of the conversion.

Quattro

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a .WKQ file.

Selecting **Quattro** from the Export menu lets you export a Paradox table into a Borland Quattro spreadsheet file.

In the exported Quattro file, each record becomes a row and each field a column. The Paradox field names will be the column headers in Row 1. The width of each column will be the width of the Paradox field, up to the maximum allowed by Quattro. If a value is wider than the column width, the full value will be converted but partially hidden.

1-2-3 and Symphony

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a .WKS or a .WK1 file.

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a .WRK or a .WR1 file.

Selecting **1-2-3** or **Symphony** from the Export menu lets you export a Paradox table into a Lotus 1-2-3 or Symphony spreadsheet file.

When you select either of these options, Paradox will ask which version of 1-2-3 or Symphony you are using.

1) 1-2-3 Release 1 2) 1-2-3 Release 2
Export to a .WKS file.

- **1) 1-2-3 Release 1**: To export to a .WKS file
- **2) 1-2-3 Release 2**: To export to a .WK1 file.

1) Symphony Release 1.0 2) Symphony Release 1.1
Export to a .WRK file.

- **1) Symphony Release 1.0**: To export to a .WRK file
- **2) Symphony Release 1.1**: To export to a .WR1 file.

In the exported spreadsheet file, the Paradox field names will be the column header in Row 1. The width of each column will be the width of the Paradox field, up to the maximum allowed by 1-2-3 or Symphony. If a value is wider than the column width, the full value will be converted but partially hidden.

DBase

1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a dBase file.

DBase lets you export a Paradox table into a dBASE II or III data file. When you select it from the Export menu, Paradox will ask which format you want to use:

1) dBase II 2) dBase III
Export to a dBase III or III PLUS file.

- **1) dBase II**: To export to a dBASE II file
- **2) dBase III**: To export to a dBASE III or III PLUS file.

This table shows how Paradox fields are converted to dBASE field types:

Paradox Field	dBASE Field
Alphanumeric (A)	**Character**
Number (N)	**Numeric (19 digits: 14 whole, 4 decimal)**
Currency ($)	**Numeric (2 decimal places)**
Short number (S)	**Numeric (5 digits)**
Date (D)	**Character (dBASE II) or Date (dBASE III)**

Pfs

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a pfs or IBM Filling Assistant file.

Selecting **Pfs** from the Export menu lets you export a Paradox table into a pfs:file or IBM Filing Assistant data file. The file will have the extension .PFS unless you provide another.

Reflex

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a Reflex file.

Selecting **Reflex** lets you export a Paradox table into a Reflex Release 1.0 or 1.1 data file. When you select it from the Export menu, Paradox will ask which format you want to use:

1)Reflex Release 1.0 2)Reflex Release 1.1
Export to an .RDX file.

- **1)Reflex Release 1.0**: To export to a Reflex Release 1.0 file
- **2)Reflex Release 1.1**: To export to a Reflex Release 1.1 file.

The table shows how Paradox fields are converted to Reflex field types.

Paradox Field	Reflex Field
Alphanumeric (A)	**Text**
Number (N)	**Numeric**
Currency ($)	**Numeric (formatted as currency)**
Short number (S)	**Integer**
Date (D)	**Date (formatted as *mm/dd/yy*)**

Note that the range of valid dates in Paradox is greater than that for Reflex. If the date in a Paradox Date (D) field exceeds the range for Reflex, it will be exported as a Date field but with an ERROR value.

VisiCalc

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a .DIF file.

Selecting **VisiCalc** from the Export menu lets you export a Paradox table into a Data Interchange Format (DIF) file for use with VisiCalc or other programs. Paradox supports the DIF standard as specified by the DIF Clearinghouse.

Ascii

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a .TXT Ascii file.

Ascii lets you export a Paradox table into an Ascii file. For example, you may want to use **Ascii/Delimited** to export a mailing list table for use with a mail-merge program. The records in the Ascii file will be separated by a carriage return and linefeed character.

Depending on the type of records you are exporting, if you plan to include the Ascii file in a document prepared with your word processor, the results may be better if you use **Report/Output/File** instead of **Export/Ascii** to store fixed-form Ascii records. See Chapter 3 (Report Basics) of *Presenting Paradox Data* for more information.

When you choose **Ascii** from the Export menu, Paradox will ask whether to delimit the fields in the Ascii file:

Delimited Text
Fields separated by commas; each record on a new line.

- **Delimited**: To export to a file in which the fields are separated and delimited
- **Text**: To export to a file in which the fields are not separated or delimited.

Delimited

Delimited Text
Fields separated by commas; each record on a new line.

Delimited lets you export a table to an Ascii file in which, by default, the fields are separated by commas and alphanumeric values are enclosed in double quotation marks (").

If you wish, you can use the Custom Configuration Program to set another field separator or delimiter, or to specify that blank number values should be exported as zeros. See Chapter 14 for details.

Text

Delimited Text
Each record of the table is written as a line in the file.

Text lets you export a one-field Paradox table into an Ascii file. Each record in the table will become one line in the text file. The field must be alphanumeric.

Import

Export Import
Convert from another file format to Paradox format.

Import lets you convert data files from other programs into Paradox tables. You can import only **data files**, not applications or forms.

Except for delimited Ascii files, data files from other programs can only be imported into **new** Paradox tables, not into existing ones. Paradox will define the structure of the new table automatically. You can use **Tools/More/Add** to add the records to an existing table as long as the tables have compatible structures.

When you choose **Import** from the Tools/Export-Import menu, Paradox will ask which format to import data from:

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Import a .WKQ file.

- **Quattro**: To import from a Borland Quattro .WKQ file
- **1-2-3**: To import from a Lotus 1-2-3 .WKS or .WK1 file
- **Symphony**: To import from a Lotus Symphony .WRK or .WR1 file
- **DBase**: To import from a dBase II, III, or III Plus .DBF file (Paradox can tell which program you have)
- **Pfs**: To import from a pfs:file or IBM Filing Assistant .PFS file
- **Reflex**: To import from a Borland Reflex (Release 1.0 or 1.1) .RXD file
- **VisiCalc**: To import from a VisiCalc or other .DIF file
- **Ascii**: To import from an Ascii.TXT file (Paradox will ask whether or not the file is delimited).

File name:
Enter name of file to import.

Type the file name or press Enter and select it from a menu. As usual, you may preface the file name with a drive or directory name (like B:DISTRICT). There is no need to type the file extension (like .WKQ for a Quattro file), although you may do so if you wish.

Finally (except when appending a delimited Ascii file to an existing table), Paradox will ask you to name the new table.

Table:
Enter name to be given to new Paradox table.

Type the new table name and press Enter. If the table already exists, Paradox will ask whether you want to replace the existing table or cancel the import.

Once you've entered a table name, Paradox will import the data file into a new Paradox table. You will see a status report on the progress of the conversion. When it's finished you'll see the new table on the screen.

The way in which Paradox converts each type of data file is described under the individual formats later in this section. Paradox always tries to use the most restrictive field type (**N**, **$**, or **D** instead of **A**) that will accept all the values in the column or field.

If Paradox can't determine a field name from the imported file, it will generate a new field name with the form *Field-n*, where *n* represents the column number of the field. If more than one field seems to have the same name, Paradox will number the duplicate fields in the form *Field Name-n,* where *Field Name* represents the duplicate name and *n* represents a sequential number.

During the import, if any record is encountered that cannot be converted, it will be placed in the temporary *problems* table.

Quattro

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Import a .WKQ file.

Selecting **Quattro** from the Import menu lets you import a Borland Quattro spreadsheet file into a Paradox table.

Paradox converts Quattro files to tables by treating each row as a record and each column as a field. Only data values—not the formulas they may be based on—are imported.

Since spreadsheets place few restrictions on entries in a column, it's often hard for Paradox to determine a consistent field type. The program will use the most restrictive field type that will accept all the values in the column. The table shows how Quattro columns are converted into Paradox field types.

Quattro Column	Paradox Field
Labels	**Alphanumeric (A)**
Numbers	**Numeric (N)**
Numbers (2 decimal places or formatted as currency)	**Currency ($)**
Numbers (formatted as dates)	**Date (D)**

These rules determine which category a column falls into:

1. The first row that contains text (usually Row 1) is assumed to contain column names. That row and any rows above it are not treated as data.
2. Any column that contains a label (text) cell is converted to an **A** field.
3. The highest number of decimal places in a column is used to distinguish **N** from **$** fields.
4. A column containing both dates and numbers is converted to an **A** field.
5. Dates in a column with labels are treated as labels; no attempt is made to distinguish text in the form *mm/dd/yy* as a date.

In view of these conversion rules, numbers in unedited spreadsheets will often be imported into Paradox alphanumeric (**A**) fields. For example, spreadsheet columns often have rows of dashes separating sections of numbers. Since only an **A** field can contain both the numbers and the dashes, the column will be converted to an **A** field even though it primarily contains numbers.

To avoid this kind of problem, edit the spreadsheet to eliminate any ambiguities. Use these techniques to make the spreadsheet look like a database:

1. Remove extraneous entries (like dashes, asterisks, and exclamation points) used to improve the spreadsheet's appearance.
2. Make sure each column contains the same kind of data and uses the same formatting options.
3. Place column titles in Row 1 since Paradox uses the first row that contains text to generate field names.

1-2-3 and Symphony

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Import a .WKS or .WK1 file.

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Import a .WRK or .WR1 file.

Selecting **1-2-3** or **Symphony** from the Import menu lets you import Lotus 1-2-3 or Symphony spreadsheet files into Paradox tables.

When you select either of these options, Paradox will ask which version of 1-2-3 or Symphony you are using:

1) 1-2-3 Release 1 2) 1-2-3 Release 2
Import a .WKS file.

- **1)1-2-3 Release 1**: To import from a .WKS file
- **2)1-2-3 Release 2**: To import from a .WK1 file.

1) Symphony Release 1.0 2) Symphony Release 1.1
Import a .WRK file.

- **1) Symphony Release 1.0**: To import from a .WRK file
- **2) Symphony Release 1.1**: To import from a .WR1 file.

Paradox converts 1-2-3 and Symphony files to tables by treating each row as a record and each column as a field. It's important to note that **only data values—not the formulas they may be based on—are imported**.

Since spreadsheets place few restrictions on entries in a column, it's often hard for Paradox to determine a consistent field type. The program will use the most restrictive field type that will accept all the values in the column. The table shows how Lotus 1-2-3 and Symphony columns are converted into Paradox field types.

Lotus Column	Paradox Field
Labels	**Alphanumeric (A)**
Numbers	**Numeric (N)**
Numbers (2 decimal places or formatted as currency)	**Currency ($)**
Numbers (formatted as date)	**Date (D)**

These rules determine which category a column falls into:

1. The first row that contains text (usually Row 1) is assumed to contain column names. That row and any rows above it are ignored as data.
2. Any column that contains a label (text) cell is converted to an **A** field.

3. The highest number of decimal places in a column is used to distinguish **N** from **$** fields.
4. A column containing both dates and numbers is converted to an **A** field.
5. Dates in a column with labels are treated as labels; no attempt is made to distinguish text in the form *mm/dd/yy* as a date.

In view of these conversion rules, numbers in unedited spreadsheets will often be imported into Paradox alphanumeric (**A**) fields. For example, spreadsheet columns often have rows of dashes separating sections of numbers. Since only an **A** field can contain both the numbers and the dashes, the column will be converted to an **A** field even though it primarily contains numbers.

To avoid this kind of problem, edit the spreadsheet to eliminate any ambiguities. Use these techniques to make the spreadsheet look like a database:

1. Remove extraneous entries (like dashes, asterisks, and exclamation points) used to make the spreadsheet look "pretty."
2. Make sure each column contains the same kind of data and uses the same formatting options.
3. Place column titles in Row 1 since Paradox uses the first row that contains text to generate field names.

DBase

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Import a dBase .DBF file.

Selecting **DBase** from the Import menu lets you import dBASE II, III, and III PLUS data files into Paradox tables.

Importing dBASE files into Paradox is a straightforward process since both dBASE and Paradox have strict rules for field types. The table shows how dBASE fields are converted into Paradox field types.

dBASE Field	Paradox Field
Character	**Alphanumeric (A) of same length**
Logical	**Alphanumeric (A) of length 1**
Number	**Number (N)**
Number (2 decimal places)	**Currency ($)**
Date (dBASE III and III PLUS)	**Date (D)**
Memo (dBASE III and III PLUS)	**Alphanumeric (A) of length 255**

Note that though a dBASE III or III PLUS memo field can hold up to 4,000 characters, Paradox will import only the first 255 characters and ignore the rest.

Pfs

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a pfs or IBM Filing Assistant.

Selecting **Pfs** from the Import menu lets you import pfs:file and IBM Filing Assistant data files into Paradox tables. (Note for IBM Filing Assistant users: The file must have a .PFS extension to be shown on the menu of files, and a non-blank extension to be imported at all.)

Since pfs:file has no specific data types, it treats every field as a character string. Therefore, for each field, Paradox looks at the values in all the records to determine a consistent field type. The program will use the most restrictive field type that will accept all the values in the field.

The table shows how pfs fields are converted into Paradox field types. Note that, though pfs attachment pages can hold any number of characters, Paradox will import only the first 255 characters and ignore the rest.

pfs Field	Paradox Field
Any value contains a non-numeric character	Alphanumeric (A)
All values contain all numeric characters	Number (N)
All values contain all numeric characters (2 decimal places)	Currency ($)
All values in format yy/mm/dd or mm/dd/yy	Date (D)
Attachment pages	Alphanumeric (A)

Reflex

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Import a .RDX file from Reflex.

Selecting **Reflex** from the Import menu lets you import a Reflex 1.0 or 1.1 data file into a Paradox table.

Importing Reflex files into Paradox is a straightforward process since both Reflex and Paradox have strict rules for field types. The table shows how Reflex fields are converted into Paradox field types.

Reflex Field	Paradox Field
Text	Alphanumeric (A)
Repeating Text	Alphanumeric (A)
Numeric	Number (N)
Numeric (formatted as currency or financial)	Currency ($)
Integer	Short number (S)
Date	Date (D)

VisiCalc

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Export to a .DIF file.

Selecting **VisiCalc** from the Import menu lets you import VisiCalc and other Data Interchange Format (DIF) files into Paradox tables. Remember to convert the spreadsheet to a DIF file before importing it.

Paradox converts DIF files to tables by treating each **tuple** as a record and each **vector** as a field. Only data values are imported—not the formulas they may be based on.

Since spreadsheets place few restrictions on entries in a column, it's often hard for Paradox to determine a consistent field type. The program will use the most restrictive field type that will accept all the values in the column. The table shows how DIF file columns are converted into Paradox field types.

These rules determine which category a column falls into:

1. If the LABEL feature of DIF has not been used to name columns, Row 1 is assumed to contain column names and is ignored as data.
2. Any column that contains text is converted to an **A** field.
3. The highest number of decimal places in a DIF column is used to distinguish **N** from **$** fields.
4. A column with both dates and numbers is converted to an **A** field.

DIF Column	Paradox Field
Text	Alphanumeric (A)
Numbers	Numeric (N)
Numbers (2 decimal places)	Currency ($)
Text (formatted as mm/dd/yy)	Date (D)

In view of these conversion rules, numbers in unedited spreadsheets will often be imported into Paradox alphanumeric (**A**) fields. For example, spreadsheet columns often have rows of dashes separating sections of numbers. Since only an **A** field can contain both the numbers and the dashes, the column will be converted to an **A** field even though it primarily contains numbers.

To avoid such problems, edit the spreadsheet to eliminate ambiguities. Use these techniques to make the spreadsheet look like a database:

1. Remove extraneous entries (like dashes, asterisks, and exclamation points) used to make the spreadsheet look "pretty."
2. Make sure each column contains the same kind of data and uses the same formatting options.
3. Use the LABEL feature of DIF to supply a name for each vector (field). If LABEL is not available, place column titles in row A.

If you've used LABEL to name a vector, Paradox will use the vector name as the field name. If not, the first tuple will be ignored as data and any text in it will be used as the field name. Where there is no text vector in the first tuple, Paradox will generate a field name in the form *Field-n*.

Ascii

Quattro 1-2-3 Symphony DBase Pfs Reflex VisiCalc Ascii
Import .ASC Ascii file.

Ascii lets you import Ascii files into Paradox tables. For example, you may want to use

Ascii/Delimited to import a mailing list file you've used with a mail-merge program. The records in the imported file must be separated by a carriage return and linefeed character.

When you choose **Ascii** from the Import menu, you will get a submenu with three choices:

Delimited AppendDelimited Text
Create a new table from an Ascii delimited text file.

- **Delimited**: To import an Ascii delimited file into a new Paradox table
- **Append/Delimited**: To import an Ascii delimited file and append the records to an existing Paradox table
- **Text**: To import a file in which the fields are not separated.

Delimited

Delimited AppendDelimited Text
Create a new table from an Ascii delimited text file.

Delimited lets you import an Ascii file with separated fields into a new table that Paradox automatically creates. By default, Paradox expects the fields in the Ascii file to be separated by commas; in addition, the values may optionally be delimited by single or double quotation marks. You may use the Custom Configuration Program described in Chapter 14 (Advanced Topics) to set another separator or delimiter.

When you select **Delimited** and select the file to import, Paradox will ask you to give a name for the new table. It then scans the Ascii file to determine the number of fields and the field types that the file contains. When establishing a field type, it uses the most restrictive type that will accept all the values in a column. Paradox then creates the new table and imports the Ascii values into it.

AppendDelimited

Delimited AppendDelimited Text
Append an Ascii delimited text file to an existing table.

AppendDelimited enables you to import a comma-separated Ascii file into an existing Paradox table. One advantage of **AppendDelimited** is that Paradox does not have to scan the Ascii file to determine the field types, so an **AppendDelimited** import takes only about half as long as a regular **Delimited** import.

After you choose a file to import, Paradox will ask for the name of the existing table to which it will append the data.

Table:
Enter name of table, or press ↵ to see a list of tables.

If the Paradox table is not keyed, the imported records from the Ascii file will be added at the end of the existing records. The next step depends on whether the existing table is keyed. If not, the imported records are simply added at the end of the existing records. If it is keyed, you have the additional choices described in the next section.

Importing Records Into Keyed Tables If the existing table is keyed, you will see a submenu with two choices:

NewEntries Update
Insert records from the Ascii file into the table.

- **NewEntries**: To import the records into the table without disturbing the existing records (similar to data entry)
- **Update**: To use the records in the imported file to update the existing records in the table.

When you select **NewEntries**, Paradox treats the records in the imported file as new records for the table. If a record in the file has the same key as an existing record in the table, the record from the **imported file** is placed in the temporary *keyviol* table. If you like, you can edit these records to remove the key violations and then merge them into the table.

With **Update**, Paradox uses the records in the imported file to update records in the table. New records are merged into the table in keyfield order.

If a record in the imported file has the same key as an existing record in the table, the **existing record** in the table is placed in the temporary *changed* table and is replaced by the record from the imported file. This makes it easy to keep track of which records have been updated.

Values That Don't Match If a value in an imported record doesn't match the field type in the Paradox table, the record will be added to a temporary *problems* table which you can view when the import is complete. Some of the conditions that cause an Ascii record to end up in the *problems* table include:

- number of fields differs from that in the table
- non-numeric data in a numeric field
- invalid date (like month 12).

The *problems* table will be composed of three fields. The first field shows the record or line number of the offending Ascii record. The second shows the first 80 characters of text. The third field shows the reason that Paradox was unable to import the record. With this information, you should be able to detect and correct the offending values.

Text

Delimited AppendDelimited Text
Each line of text becomes a table record.

Text lets you import an Ascii file in which the fields are not separated by a special character. The new table created by Paradox to hold the data will have a single field called Text. Each line in the imported file will become one record in the table.

If there are any records in the Ascii file that can't be converted, Paradox will place them in the temporary table called *problems*. You can then decide whether to edit, discard, or handle them in some other way. Remember that *problems* will be deleted the next time you import or restructure data, or when you exit from Paradox.

International Considerations

Paradox allows you to import or export numeric and currency data that is formatted with the international convention for separating decimal and whole numbers. If you are importing data from programs such as Quattro, 1-2-3, Symphony, and dBase, Paradox will automatically import and export numbers and currency correctly no matter which convention you choose.

However, when you export or import numeric data from an Ascii, pfs, or IBM Filing Assistant file that is formatted using a non-U.S. convention (e.g., the number 1.234,56), it is necessary to tell Paradox the character that will represent the decimal separator.

To enable you to do this, there is a selection on the Custom Configuration Program AsciiConvert menu called **ChooseDecimal**. Since the "," is often used as a field separator, if you are importing delimited numeric data that uses the "," as the decimal separator, there could be a conflict between the decimal separator and the field separator. To prevent this potential ambiguity, you should make sure that all the fields in the file you are importing are delimited.

You can make certain that there is no ambiguity when you are exporting Paradox data to other systems by choosing the **Delimiters/Always?/Allfields** option from the AsciiConvert menu. See Chapter 14 for more information on importing Ascii data.

ExportImport on a Network

When you use **Tools/ExportImport** on a network, Paradox automatically locks the Paradox objects involved in the operation:

- When you **Export** a Paradox table to a file, Paradox automatically places a write lock on the table. This means that other users cannot modify its contents or structure. If someone else on the network has started an operation that requires a full lock or prevent write lock on the table, you won't be able to export it until that user has finished working with it.
- When you **Import** a file into a Paradox table, Paradox automatically places a full lock on the table. This means that other users cannot work with it in any way until the records are imported. If anyone else on the network is using the table in any way, you won't be able to import the file until that user has finished working with the table.

Paradox cannot lock the non-Paradox files involved in an import or export operation. It will, however, check to make sure that no other network users are working with a file before the operation begins.

Copy

Rename QuerySpeedup ExportImport Copy Delete Info Net More
Make a copy of a table, custom form, report, script, or graph.

Copy lets you make a copy of a table, form, report, script, graph, or table family. **This is the best way to back up your Paradox data to protect yourself in case of damage. Copy** is also useful when you want to test out changes to an object while retaining the original, or exchange objects with another Paradox user.

When you choose **Copy** from the Tools menu, you will see a menu of the types of objects you can copy:

Table Form Report Script JustFamily Graph
Copy a table and its family of forms, reports, and indexes.

- **Table**: To copy a table and its entire family of forms, reports, indexes, and other objects
- **Form**: To copy a form
- **Report:** To copy a report
- **Script**: To copy a script
- **JustFamily:** To copy all the objects in a table's family except the table itself
- **Graph**: To copy a graph settings file.

Depending on the type of object you select, Paradox will prompt or show a menu for the names of the object and the copy. For a script, for example, you will see these prompts:

Script:
Enter name of script to copy, or press ↵ to see a list of scripts.

Script:
Enter name for the new script.

After you enter each name, Paradox will make the copy. If there is already an object with the name you chose, you will have a chance to confirm or cancel.

Table

Table Form Report Script JustFamily Graph
Copy a table and its family of forms, reports, and indexes.

Table lets you copy a table **and its entire family of forms, reports, indexes, and other objects**. Because it works on the whole family, it's **much better** to use **Copy/Table** than the DOS *copy* command to copy or back up **all** the information associated with a table.

Form

Table Form Report Script JustFamily Graph
Make a copy of a form.

Form, which lets you copy a form, is especially useful when you want to design a new form that's similar to an existing one. You can also use it to copy a form from one table to a related table, like *answer*, as long as it has exactly the same field structure.

When you choose **Form** from the Tools/Copy menu, you'll see a submenu with two choices. These allow you to specify the table the new form should be associated with:

SameTable DifferentTable
Copy the form to the same table

- **SameTable**: To copy the form to the same table
- **DifferentTable**: To copy the form to a different table with the a compatible structure.

When you choose **DifferentTable**, Paradox asks you for the source table and form, what table to copy it to, and what to name the form. the two tables must have compatible structures to copy forms between them.

Report

Table Form Report Script JustFamily Graph
Make a copy of a report specification.

Report, which lets you copy a report, is especially useful when you want to design a new report that's similar to an existing one. You can also use it to copy a report from one table to another related table, like *answer*.

When you choose **Report** from the Tools/Copy menu, you'll see a submenu with two choices. These allow you to specify the table the new report should be associated with:

SameTable DifferentTable
Copy the form to the same table

- **SameTable**: To copy the report to the same table
- **DifferentTable**: To copy the report to a different table with a compatible structure.

If you choose **DifferentTable**, Paradox will ask you for the source table and report, what table to copy it to, and what to name the report. The two tables must have compatible structures to copy reports between them.

Script

Table Form Report Script JustFamily Graph
Make a copy of a script.

Script lets you make a copy of a Paradox script. For example, if you want to enhance a script with PAL commands, you'll probably want to work with a copy while leaving the original script intact.

JustFamily

Table Form Report Script JustFamily Graph
Copy reports, forms, validity checks, and settings to another table.

JustFamily lets you copy all the objects associated with a table **except the table itself.** Suppose you've used a query to select records from a large table. You can use **JustFamily** to copy the forms, reports, and other objects from the original table to use with the *answer* table.

When you select **Tools/Copy/JustFamily**, there must already be a target table to "receive" the copied objects. That table must have the name you give to the copy, and its structure must be identical with that of the table from which the objects are copied.

Objects associated with the source table will overwrite target objects that have the same name or number. Other objects in the target table's family will not be affected.

Graph

Table Form Report Script JustFamily Graph
Make a copy of a graph setting.

Graph lets you make a copy of a graph settings file. This is useful if you want to change it while still retaining the original.

Copying Objects on a Network

When you use **Tools/Copy** on a network, Paradox's automatic locking depends on what you're copying:

- When you copy a **Table**, Paradox automatically places a write lock on the source table and its family and a full lock on the target table and its family. This means that other users
  - cannot modify the contents or structure of any object in the source family
  - cannot work with any object in the target family (if it already exists) in any way until the copy is complete. If someone else on the network has started an operation that requires a full or prevent write lock on any object in the source family, or if anyone else is using the target table or family in any way, you won't be able to make the copy until that user has finished working with it.
- When you copy **JustFamily**, Paradox automatically places a write lock on the source table's family, but only a prevent full lock on the source table itself. A full lock is placed on the target table and its family.
- When you copy a **Form**, **Report**, **Script** or **Graph**, Paradox automatically places a write lock on the source object and a full lock on the target objects. This means that other users
  - cannot modify the source object
  - cannot work with the target object (if it already exists) in any way

  until the copy is complete. If someone else on the network has started an operation that requires a full or prevent write lock on the source object, or is using the target object in any way, you won't be able to make the copy until that user has finished working with it.

  If the object is a **Form** or **Report**, Paradox also places a prevent full lock on the table. This means that other users cannot perform any operation that requires a full lock (such as restructuring the table) until the copy is made. If someone else on the network has started an operation that requires a full lock on the table, you won't be able to copy the object until that user has finished working with the table.

Delete

Rename QuerySpeedup Export/Import Copy Delete Info Net More
Delete a table, form, report, script, graph, or query speedup file.

Delete lets you erase a table, form, report, graph, script, query-speedup index, or a setting or validity-check file from the disk. Use **Delete** when you no longer need one of these objects.

When you choose **Delete** from the Tools menu, you will see a menu of the types of files you can delete:

Table Form Report Script QuerySpeedup KeepSet ValCheck Graph
Delete a table and its family of forms, reports, and indexes.

- **Table**: To delete a table and its entire family of forms, reports, indexes, and other objects
- **Form**: To delete a form
- **Report**: To delete a report
- **Script**: To delete a script
- **QuerySpeedup**: To delete all the query-speedup files (secondary indexes) for a table
- **KeepSet**: To delete the image settings stored for a table
- **ValCheck**: To delete the validity checks stored for a table
- **Graph**: To delete a graph settings file.

  Caution: *Be careful when deleting objects; once deleted they can't be recovered. Use special care when deleting tables (because the table's entire family also will be deleted) and query-speedup files (because all secondary indexes on the table will be deleted). Before deleting, you may want to make an extra backup just in case.*

Depending on the type of object you select, Paradox will prompt or show a menu for the name of the object to delete. For a report, for example, it will first ask which table the report is for.

Table:
Enter name of table with report to delete, or press ↵ for a list of tables.

When you type the table name or select it from a menu, Paradox will show a menu of existing reports for that table.

R 1 3 6 7
Standard Report

Before deleting an object or family, Paradox will double-check to make sure you really want to delete it:

Cancel OK
Do not delete report.

- **Cancel**: To change your mind and leave the object intact
- **OK**: To tell Paradox to go ahead and delete the object.

Deleting Objects on a Network

When you use **Tools/Delete** on a network, Paradox's automatic locking depends on what you're deleting:

- When you delete a **Table**, Paradox automatically places a full lock on the table and its family. This means that other users will not be able to work with it while it is being deleted. (And, of course, no one will be able to use it after it's deleted.) If anyone else on the network is using the table or its family in any way, you won't be able to delete it until that user has finished working with it.
- When you delete a **Form**, **Report**, **Script**, or **Graph** Paradox automatically places a full lock on the object. This means that other users will not be able to work with it while it is being deleted. If anyone else on the network is using the object in any way, you won't be able to delete it until that user has finished working with it.

  Also, if the object is a **Form** or **Report**, Paradox places a prevent full lock on the table. This means that other users cannot perform any operation that requires a full lock (such as restructuring the table) until the delete is finished. If someone else on the network has started an operation that requires a full lock on the table, you won't be able to delete the object until that user has finished working with the table.
- When you delete a **QuerySpeedup** or **KeepSet** file, Paradox automatically places a full lock on both the object and the table. This means that other users will not be able to work with the table in any way while the object is being deleted. If anyone else on the network is using the table or object in any way, you won't be able to delete it until that user has finished working with it.

Info

Rename QuerySpeedup ExportImport Copy Delete Info Net More
Show names of objects, DOS files, table fields, network users, locks.

Info is a powerful way to get information about your tables, forms, reports, scripts, and files. You can use it to find out just what objects you have in your database and how your tables are structured.

For instance, you can use **Info/Inventory** to browse through a list of stored Paradox objects to see which ones should be deleted. You can also use it as a file-management system to produce regular catalogs of all the files on your disks without leaving Paradox to use DOS commands.

When you choose **Info** from the Tools menu, Paradox will ask what kind of information you want:

Structure Inventory Family Who Lock
Show field names and field types for a specified table.

- **Structure**: To display the structure of a table
- **Inventory**: To list the tables, scripts, or files on a disk
- **Family**: To list the forms, reports, and other objects associated with a table
- **Who**: To list the names of Paradox users on a network
- **Lock**: To list all locks currently placed on a table.

Structure

Structure Inventory Family Who Lock
Show field names and field types for a specified table.

Structure lets you view the structure of a table. It is handy when you want to refresh your memory about the structure of a table, when you are considering borrowing the structure for another table, or when you want to experiment with the structure of a table without actually changing it.

When you select **Structure** from the Tools/Info menu, Paradox will ask which table you want to show.

Table:
Enter name of table whose structure to show, or press ↵ for a list of tables.

When you type the table name or select it from a menu, Paradox will display the table's structure in a temporary table called *struct*. The message window will note the number of records in the table.

You can query, edit, and work with this version of *struct* just as with any Paradox table. **If you edit or delete the *struct* table, however, it will have no effect on the structure of the original table.**

You can use **Modify/Restructure** or **Tools/Delete** to restructure or delete the table if you wish.

Since *struct* is a temporary table, you should rename it if you want to keep it stored on disk.

A table structure

STRUCT	Field Name	Field Type
1	Cust ID	N*
2	Last Name	A15
3	Init	A1
4	Street	A20
5	City	A15
6	State	A2
7	Zip	A5
8	Country	A12
9	Credit	$

Field names — Field types

Inventory

Structure Inventory Family Who Lock
List tables, scripts, or DOS files.

Inventory displays a list of the tables, scripts, or files stored in any directory on your computer system. It provides a quick and efficient method of keeping track of your files and Paradox objects. For example, you can browse through them to see which are no longer useful and can be deleted.

Since **Inventory** works on any files, not just Paradox files, you can use it to catalog and manage all the files on your computer system.

When you choose **Inventory** from the Tools/Info menu, you will see a submenu of the types of files you can list.

Tables Scripts Files
List tables.

- **Tables**: To list the tables on a disk or directory
- **Scripts**: To list the scripts on a disk or directory
- **Files**: To list all or selected files on a disk or directory.

What happens next depends on the type of file you select, as described below. Whichever type of file you choose, the table, script, or file names will be displayed in a temporary Paradox table called *list*. The date each file was last modified is also displayed. Although you can query, edit, and work with *list* like any other Paradox table, you must rename it if you want to save the information on disk.

Tables and Scripts

Tables Scripts Files
List tables.

Tables Scripts Files
List scripts.

When you select **Tables** or **Scripts** from the Info/Inventory menu, Paradox will prompt you for the directory name.

Directory:
Enter directory for list of tables, or press ↵ for current directory.

If the tables or scripts you want to see are in the current drive and directory, simply press [Enter]. Otherwise enter a drive and/or directory name, such as **b:** or **c:\mktg**.

If you are working on a network, Paradox will automatically include temporary tables (which are stored in your private directory) in the inventory of tables in your current directory. See the discussion of **Net/SetPrivate** later in this chapter for details.

Files

Tables Scripts Files
List DOS files.

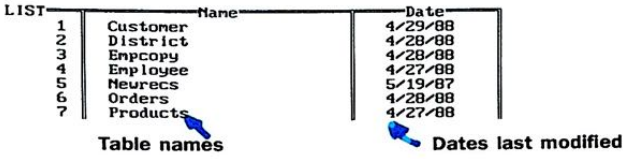
When you select **Files** from the Info/Inventory menu, Paradox will prompt you for a **pattern** for the file names to meet.

Pattern:
Enter DOS directory pattern (e.g., *.* for all files in current directory).

Type the file specification you want to list, just as in a DOS *dir* command. You may precede the file spec with a drive and/or directory name if you wish. For example, to see all the files with a .TXT extension in the *\mktg\corresp* directory on drive C, type **c:\mktg\corresp*.txt**. To see all the files in the current directory, simply type *.*.

Info/Inventory gives you the power—not provided by DOS—to develop an efficient file-management system. Every week, for example, you could store a *list* table of the files in each directory, then play a query script that reports which files were updated during the week.

A table inventory



Family

Structure Inventory Family Who Lock
List forms and reports associated with a table.

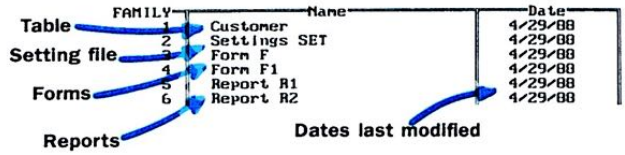
Family lists the reports, forms, and other objects associated with a Paradox table. You may wish to generate this list to see which forms and reports you've created and which are no longer needed.

When you select **Family** from the Tools/Info menu, Paradox will prompt you for the name of the table whose family you want to see.

Table:
Enter name of table to list its family, or press ↵ for a list of tables.

Type the table name or select it from a menu. The object names and the dates they were last modified will appear in a temporary Paradox table called *family*. The *family* listing for secondary indexes indicates which field the index is for and whether or not it is incrementally maintained (see Chapter 14 for details). You can rename this table if you want to save the information.

A family portrait



Who

Structure Inventory Family Who Lock
List users currently running Paradox on the network.

On a network, **Who** lists the users who are using Paradox at the moment. It is useful, for example, when you want to place a lock on an object and want to find out who might be inconvenienced.

When you select **Who** from the Tools/Info menu, the names of current users will appear in a temporary *list* table. You can rename this table if you want to save the information for some reason.

The user names are based on information entered through the Tools/Net/UserName selection or read directly from the network. See Tools/Net/UserName later in this chapter for more information.

Lock

Structure Inventory Family Who Lock
List locks for a table.

On a network, **Lock** lists all the locks that are currently placed on a table and its family and who has placed them. It is useful, for example, when you need to see all of the locks that must be removed from a table before you can begin a particular operation.

When you select **Lock** from the Tools/Info menu, Paradox will prompt you for the table whose locks you want to see.

Table:
Enter name of table, or press ↵ to see a list of tables.

Type the table name or select it from a menu. You will see a temporary *list* table that contains, for each lock, the file (object) name, the name of the user who locked it, and the type of lock. You can rename this table if you want to save the information for some reason.

The user names are based on information entered through the **Tools/Net/UserName** selection or read from the network. See **Tools/Net/UserName** later in this chapter for more information.

If the table you request is not in a shared directory, you'll see the message **File is not shared** instead of a *list* table.

LIST	FileName	UserName	LockType
1	Music.db	George	Prevent Full Lock
2	Music.db	Bill	Prevent Full Lock
3	Music.db	Janet	Write Lock

File names User names Types of locks

Getting Info on a Network

When you use **Tools/Info** on a network, the locks that Paradox automatically applies depend on what kind of information you're getting:

- When you list the **Structure** of a table, Paradox automatically places a prevent full lock on the table. This means that other users cannot perform any operation that requires a full lock (such as **Restructure**) until the structure is listed. If someone else on the network has started an operation that requires a full lock on the table, you won't be able to list its structure until that user has finished.
- When you list the **Family** of a table, Paradox automatically places a write lock on the table and its family. This means that other users cannot modify the contents or structure of any object in the family until the family is listed. If someone else on the network has started an operation that requires a full or prevent write lock on any of these objects, you won't be able to list the family until that user has finished.

Getting any other kind of **Info** does not affect other users in any way.

Net

Rename QuerySpeedup ExportImport Copy Delete Info Net More
Lock tables, change private directory, set user name and refresh interval.

When you use Paradox on a network, it automatically manages shared resources. Automatic locking mechanisms are designed to ensure

- **Maximum concurrent use of shared objects**. Multiple users can view, query, report on, edit, and enter data into the same table simultaneously.
- **Data consistency**. All images of a table are automatically updated with changes made by all users working with that table.
- **Data integrity**. When two or more users are working with the same table, it is protected from damage or corruption.

Because it has automatic locking capabilities for all operations, you'll use Paradox on a network in exactly the same way you use it on your own computer. Typically, you don't have to worry about what other users are doing; in fact, you often won't notice that there **are** other users unless they are sharing and making changes to a table you're using, or they've locked an object you need.

However, should you ever need to, you can at any time use the options in the Tools/Net menu to explicitly control the way Paradox manages shared resources.

When you choose **Net** from the Tools menu, you will see five choices:

Lock PreventLock SetPrivate UserName AutoRefresh
Lock or unlock a table.

- **Lock:** To explicitly place or remove a full lock or write lock on a table
- **PreventLock**: To explicitly place or remove a prevent full lock or prevent write lock on a table
- **SetPrivate**: To change the location of your private directory
- **UserName**: To set or change your Paradox network user name
- **AutoRefresh**: To change the interval at which you see changes other users make to tables you're working with.

These concepts are all introduced in "Using Paradox on a Network" in Chapter 2 (Fundamentals).

Lock and PreventLock

Lock PreventLock SetPrivate UserName AutoRefresh
Lock or unlock a table.

Lock PreventLock SetPrivate UserName AutoRefresh
Prevent others from locking a table.

Paradox automatically locks tables, forms, reports, and other objects as needed to ensure data integrity and consistency. Locks temporarily restrict other users from accessing a table, form, or report while you are using it. Paradox provides the maximum degree of concurrent access consistent with the prevention of corruption and loss of data. Table 2-5 in Chapter 2 shows the locks automatically applied for each operation.

In addition to automatic locking, you can also **explicitly** place and release locks on tables you are working with. In decreasing order of restriction on concurrent use of objects, the four kinds of locks are:

- **Full lock**, which gives you exclusive access to a table or other object, while preventing all other users from accessing it for any reason. Full locks preclude concurrent access to the locked object.
- **Write lock**, which lets other users access a table or other object you are using, but not change its structure or contents.
- **Prevent write lock**, which prevents other users from placing either a full lock or a write lock on an object. Prevent write locks guarantee that other users will not be able to block you from carrying out any operation that requires you to modify an object.
- **Prevent full lock**, which prevents other users from placing a full lock on an object. Prevent full locks provide the maximum level of concurrent use of an object. Other users may perform operations that place write locks and prevent write locks on an object.

The third and fourth kinds of locks are really restrictions on the ability to place the first two kinds.

Unlike automatic locks, explicit locks remain in effect until you explicitly release them or leave Paradox. Also, a table need not be on the workspace or in use in any way in order for you to place an explicit lock on it. Otherwise, there is no difference in the effects of automatic and explicit locks. You won't be able to place an explicit lock if there is already an automatic or explicit lock that precludes the type of lock you are trying to set. See Table 2-4 for a table of compatible lock types.

You can only release a lock that you yourself have placed.

When to Place Explicit Locks

You may want to lock a table explicitly when you know you are going to need it and you want to make sure it is available.

- Suppose you want to enter new records into the *customer* table. When you begin the operation by selecting **Modify/DataEntry**, Paradox places a prevent full lock on *customer*. This prevents other users from changing the table's structure while you are entering data into it. Then, when you press Do-It! [F2] to add the new records to *customer*, Paradox tries to place a prevent write lock on the table.

  But suppose another user places a write lock on *customer* while you are entering data. In that case, when you press Do-It! [F2], Paradox will not be able to place a prevent write lock on the table to finish the data entry operation. You will have to use the **KeepEntry** selection (see Chapter 7) or wait until the write lock is released.

  If you anticipate such a situation, you could explicitly place a prevent write lock on the *customer* table before you begin data entry. This guarantees that the table will be available to you when you want to complete the operation.

- Similarly, suppose you know you will need to print a report just before an important presentation. Since **Report/Output** requires a prevent full lock on the table, you might place this lock explicitly several minutes before you actually need it, just to make sure no one blocks you by placing a full lock on the table first.

Since Paradox's automatic locks generally give you the resources you need while maximizing concurrent access, we don't recommend placing explicit locks as a matter of course. It's always best to reserve explicit locks for those situations where you've learned from experience that you need to reserve a certain level of access to a table while you can. Follow these general guidelines:

- **When using Paradox interactively, place explicit locks sparingly since they may needlessly prevent other users from accessing objects.**
- **When you've finished using an object you have locked explicitly, always release the lock immediately.**

You should in particular place explicit full locks only in extraordinary circumstances. If you forget to release a full lock, no one else will be able to use the table until you remember or leave Paradox.

If your workstation crashes (fails) while you have locked a table, the lock is not released. You should reboot onto the network as soon as possible. As soon as you are reconnected to the network, the locks will be released.

This is true of automatic locks as well as explicit ones.

How to Place and Release Explicit Locks

The way to place or release an explicit lock depends on the type of lock you need to use.

1. To place or release a full or write lock on a table, select **Tools/Lock**.

```
Lock  PreventLock  SetPrivate  UserName  AutoRefresh
Lock or unlock a table.
```

A menu will ask which type of lock you want:

```
FullLock  WriteLock
Get or release exclusive access to a table.
```

- **FullLock**: To place or release a full lock on a table
- **WriteLock:** To place or release a write lock on a table.

2. To place or release a prevent full or prevent write lock on a table, select **Tools/PreventLock**.

```
Lock  PreventLock  SetPrivate  UserName  AutoRefresh
Prevent others from locking a table.
```

A menu will ask which type of lock you want:

```
FullLock  WriteLock
Prevent others from getting a Full Lock on a table.
```

- **FullLock**: To place or release a prevent full lock on a table
- **WriteLock**: To place or release a prevent write lock on a table.

Once you've selected the type of lock you're interested in, the rest of the process is the same. Paradox will ask which table the lock is for:

```
Name:
Enter name of table to lock or unlock, or press ↵ to see a list of tables.
```

Type the table name or press [Enter] and select it from a menu. Finally, you'll be asked whether to place or release the lock:

```
Set  Clear
Place the lock on the table.
```

- **Set**: To place the lock you've specified
- **Clear**: To release the lock you've specified.

The exact prompts and menus will vary depending on which type of lock you've chosen. When you choose **Set** or **Clear**, Paradox will attempt to place or release the lock you've specified. A message will tell you whether the lock was successful.

Remember to release an explicit lock as soon as you've finished with the table.

More on Locking

Each shared table may have an essentially unlimited number of automatic and explicit locks applied to it, so long as these locks are **compatible**. Table 2-4 shows the lock types that are compatible with each other. In order to gain access to a table for a particular operation, all locks (both automatic and explicit) that preclude the operation must be removed.

For example, suppose that Richard, Paul, and April are all using the *orders* table. Richard and Paul are viewing *orders*, and April is in the process of copying it to another table. Thus, there are currently three locks on *orders*: two prevent full locks (one placed by Richard and one placed by Paul) and a write lock (placed by April).

Now suppose that Mike wants to restructure *orders*. Since restructuring a table requires its exclusive use (and thus needs a full lock), Mike will have to wait until all other users complete their use of it before restructuring. On the other hand, if Mike would like to query the table (which requires only a prevent full lock) he will have no problem.

You can use the **Tools/Info/Lock** selection to determine all of the locks that are currently in effect for a particular table.

SetPrivate

Lock PreventLock SetPrivate UserName AutoRefresh
Change the private directory.

When you use Paradox on a network, your **working directory** is most often a network directory where shared tables and other objects are stored. Each Paradox user on a network must also have a **private directory** where temporary objects are stored.

Your private directory serves two functions:

- Storing Paradox temporary tables and other temporary objects
- Storing non-temporary objects that you don't want other users to access.

On a network, all temporary objects that Paradox generates during your session will be placed in your private directory. For example, whenever you perform a query, the resulting *answer* table is placed in your private directory. This prevents another user's temporary objects from overwriting your own.

- **Even though these temporary objects are actually stored in your private directory, when you are using Paradox it will appear as though they are present in your current working directory.**

Most of the time you will not even be aware that your private directory is being used. At the Paradox level, all temporary objects stored in your private directory will be added to the listings of objects in your current working directory that Paradox produces. Of course, at the DOS level, this integration does not take place.

For example, let's say your working directory is *f:\gifts* and your private directory is *c:\paradox3*. If you do a query on the *customer* table, the *answer* will actually be stored in your private directory. However, for all Paradox operations, it will appear as if it is in your working directory.

You can check this by selecting **Tools/Info/ Inventory/Tables** for the current directory. You'll see *answer* included in the list of tables in *f:\gifts*. Yet if you select **Tools/Info/Inventory/Files** to get a list of all DOS files in *f:\gifts*, ANSWER.DB will **not** be on the list.

Your private directory also allows you exclusive use of all of the tables and other objects that are stored there. There are several reasons you might want to keep non-temporary objects in your private directory. Among these are

- **Security and exclusivity**. No other user can access any objects in your private directory.
- **Efficiency**. Because there is no contention for objects stored in your private directory, Paradox knows that they do not have to be locked when you use them.

Selecting a Private Directory

As with most Paradox multiuser capabilities, you can either designate a private directory explicitly, or Paradox can do it for you automatically. In most cases, it's preferable to explicitly designate your private directory. In most network installations, the network administrator is responsible for establishing the location of each user's Paradox private directory. There are two ways to do this:

- **Through the Custom Configuration Program**. You can use the Custom Configuration Program to designate a default private directory that will be set each time you start Paradox. See Chapter 14 (Advanced Topics) for details.

- **Through Tools/Net/SetPrivate**. You can use **Tools/Net/SetPrivate** to designate or change your private directory during a Paradox session. **When you change a private directory, the workspace will be cleared and all temporary tables will be deleted**.

In general there is a single preferred location for your private directory depending upon the configuration of your computer or workstation:

- If your workstation has a local hard disk, it is almost always preferable to put your private directory there.
- If you have no local storage, your private directory must be located on the network. Typically, your private directory will be your "home" directory on the network.

Note that other users will not be able to access objects in your private directory. You should therefore make sure that other users do not need to use any tables, scripts, and other objects stored in a shared network directory you choose for your private directory.

Setting Up Your Private Directory

To designate or change your private directory, select **SetPrivate** from the Tools/Net menu. Paradox will ask which directory you want to be your private directory. If you've already designated a private directory either through the Tools/Net menu or through the Custom Configuration Program it will be filled in.

```
Directory:
Enter new private directory; include drive and full path.
```

Enter the full path name of the private directory you want to designate; then press [Enter]. You will not be able to declare a directory private if someone else has already done so, or if other network users are using tables, scripts, or other objects located there.

When you change your private directory Paradox must clear the workspace and delete all temporary objects in your current private directory. Therefore, before changing your private directory, Paradox will double-check to make sure you really want to do so:

```
Cancel  OK
Do not change private directory.
```

- **Cancel**: To change your mind and leave your private directory, the workspace, and temporary tables intact
- **OK**: To tell Paradox to go ahead and change your private directory, clear the workspace, and delete the temporary tables.

When you select **OK**, a message will confirm that your private directory has been changed.

Automatic Designation of a Private Directory

If you haven't designated a private directory through the CCP or **SetPrivate**, Paradox will automatically choose a private directory for you. It will also try to do this if for some reason the directory you've explicitly designated cannot be made private. Paradox uses the following rules to decide where to put a private directory:

- If your computer or workstation has a local hard disk (drive C), Paradox will designate the DOS connected directory on C as your private directory.
- If your computer or workstation does not have drive C, Paradox will try to designate the network directory you were connected to when you started Paradox as your private directory.

If you don't have a local hard disk and you've not used the CCP to set up a PARADOX3.CFG file that explicitly designates your private directory, you won't be able to start Paradox from the shared read-only directory containing the Paradox system files or from a directory that contains Paradox objects that any other users are working with. In this case, you'll see the message **Can't start Paradox: can't get private directory**.

You'll need to change to a directory which no other network users are working in, and start Paradox from that directory. In order to do so, you must make sure that the directory containing the Paradox system files is on your path.

UserName

```
Lock  PreventLock  SetPrivate  UserName  AutoRefresh
Change your user name.
```

When you fail to gain access to a locked object, Paradox tells you who has locked it. This lets you request access directly from the other user if you wish.

To do this, Paradox tries to associate a name with each person using it on the network. On networks that support user names (such as Novell and 3Com), Paradox uses the network operating system to identify each user, so it's not necessary for you to enter your user name explicitly. However, if your network doesn't support user names, or if you'd like to change yours, you can use **Tools/Net/UserName** to designate your user name during a Paradox session. The name you enter will override any user name read from the network.

You can also use the Custom Configuration Program to designate a default user name that will

be set each time you start Paradox. See Chapter 14 (Advanced Topics) for details. You can still use **Tools/Net/UserName** to override the default.

To designate or change your user name, select **UserName** from the Tools/Net menu. Paradox will ask what name you want to use; your present user name (if any) will already be filled in.

```
Name:
Enter new user name.
```

Type a name of up to 15 characters and then press [Enter]. You can use any name that identifies you to other users on the network; it need not be your network login name.

Before changing your user name, Paradox will double-check to make sure you really want to do so:

```
Cancel  OK
Do not change user name.
```

- **Cancel:** To change your mind and retain your present user name
- **OK:** To go ahead and change your user name.

When you select **OK**, a message will confirm that your user name has been changed. The new name will last for the current Paradox session and override any user name picked up from the network or from the Custom Configuration Program.

AutoRefresh

```
Lock  PreventLock  SetPrivate  UserName  AutoRefresh
Change the automatic refresh interval.
```

When you share a table with other users, their changes to it are not reflected instantaneously on your screen, but only when your screen is **refreshed** (updated). There are several ways for this to happen:

- You can press Refresh [Alt][R] at any time to update the current image.
- By default, Paradox automatically looks every three seconds to see if other users have made changes to the tables with which you are working. Use **Tools/Net/AutoRefresh** to change the interval at which your screen is automatically refreshed during the current session.

  You can also use the Custom Configuration Program to change to a default autorefresh interval. See Chapter 14 (Advanced Topics) for details. Any interval you set with **Tools/Net/AutoRefresh** will override the default you set with the CCP.
- Regardless of the autorefresh interval, Paradox will automatically update your screen as needed. For example, if you begin to make changes to a record that has already been changed by another user, Paradox will automatically refresh the image.

The autorefresh interval you set should reflect the way you work with Paradox. Some users find frequent updates distracting and prefer that records be updated only when needed. If this is your preference, you can disable the autorefresh capability by leaving the interval blank. For other users fixed, short intervals are appropriate because they want to see other users' changes as soon as they happen. Remember that you can always press Refresh [Alt][R] to update the current image.

To change the autorefresh interval, select **AutoRefresh** from the Tools/Net menu. Paradox will ask how often to refresh the screen, in seconds.

```
Interval:  3
Enter refresh interval in seconds or leave blank to disable.
```

You can enter any interval between 1 and 3600 seconds (one hour), or leave the interval blank to disable automatic refresh. When you press [Enter], a message will confirm your new autorefresh interval. The interval you set will last for the current Paradox session and override any default set through the Custom Configuration Program.

More

Rename QuerySpeedup ExportImport Copy Delete Info Net More
Add, Subtract, Empty, Protect, change the working directory, go to DOS.

Selecting **More** from the Tools menu displays a submenu of additional tools for managing your data. These tools let you add or remove groups of records from tables, protect tables and scripts from unauthorized access or modification, and change your working directory.

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Add records in one table to those in another.

When you choose **More**, you will see eight choices:

- **Add**: To add the records in one table to another
- **MultiAdd**: To add the records in one table to records in two or more tables
- **FormAdd**: To add records to tables through a multitable form
- **Subtract**: To remove from one table records that are duplicated in another
- **Empty**: To remove all the records from a table
- **Protect**: To password- or write-protect a table or script and to clear passwords
- **Directory**: To change the working directory
- **ToDOS**: To temporarily suspend Paradox and enter DOS.

Add

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Add records in one table to those in another.

Add lets you add the records in one table to those in another without having to retype them. For example, you may want to combine three separate tables of receivables—*january, february,* and *march*—into one table called *quarter1*. Or you could use **Add** to merge several separate mailing lists into one.

When you select **Add** from the Tools/More menu, Paradox will prompt for the names of the tables providing and receiving the records.

Source table:
Enter name of table with records to add, or press ↵ for a list of tables.

Target table:
Enter name of table to add records to, or press ↵ for a list of tables.

The two tables involved in table addition must have **compatible** (though not necessarily identical) field types in the same order. This means that

- any kind of numeric (**N**, **$**, or **S**) field can be added to another
- an alphanumeric (**A**) field of any length can be added to another
- a date (**D**) field can only be added to another date field

If a long **A** field is added to a short one, any values that don't fit will be truncated (cut off). Characters lost in this way cannot be retrieved (although they still exist in the source table). You can avoid this problem by using **Modify/Restructure** to enlarge the short **A** field before adding the records.

The next step depends on whether the target table is keyed. If not, the records from the source table are simply added to the end of the target table. If it is keyed, you have additional choices as described below.

Note that **Tools/More/Add** does not change the source table in any way. It doesn't matter whether the source table is keyed or not.

Adding Records to Keyed Tables

If the target table is keyed, you will see a submenu with two choices:

NewEntries Update
Insert records in the source table into the target table.

- **NewEntries**: To add the records in the source table to the target table without disturbing the existing records (similar to data entry)
- **Update**: To use the records in the source table to update the existing records in the target table.

NewEntries

NewEntries Update
Insert records in the source table into the target table.

When you select **NewEntries**, Paradox treats the records in the source table as new records for the target table. If a record in the source table has the same key as an existing record in the target table, the record from the **source** table is placed in the temporary *keyviol* table. If you like, you can edit these records to remove the key violations and then merge them into the target table.

Update

NewEntries Update
Use the records in the source table to update the target records.

With **Update**, Paradox uses the records in the source table to update records in the target table.

New records are merged into the target table in key-field order.

If a record in the source table has the same key as an existing record in the target table, the record in the **target** table is placed in the temporary *changed* table and is replaced by the record from the source table. This makes it easy to keep track of which records have been updated.

Adding on a Network

When you use **Tools/More/Add** on a network, Paradox automatically places a write lock on the source table and a prevent write lock on the target table. This means that other users

- cannot modify the contents or structure of the source table
- cannot perform any operation that requires a full or prevent write lock on the target table

until the records are added. If someone else on the network has started an operation that requires a full or prevent write lock on the source table, or a full or write lock on the target table, you won't be able to add the records until that user has finished working with it.

MultiAdd

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Add records from one table to two or more tables simultaneously.

MultiAdd allows you to add records from one table to the records of two or more tables at once. Using **MultiAdd**, you can perform a query linking several tables into a new combined table, then edit the combined table and have the changes be transferred back to the original tables.

In its operation, **Tools/More/MultiAdd** is very similar to the **Modify/MultiEntry** selection described in Chapter 7 (Modify). However, while **Modify/MultiEntry** is only used for data entry, with **Tools/More/MultiAdd** you can specify whether you want the source records to replace or be added to the records in the target tables.

Before you can use **Tools/More/MultiAdd**, you must have three components in place:

- a single **source table** that contains the information you want to add
- two or more **target tables** into which the data entered in the source table will be transferred
- a predefined **map** that tells Paradox which fields in the target tables correspond to the fields in the source table.

The records in the source table will not be changed in any way by **MultiAdd** and a key on the source table does not affect the **MultiAdd** process one way or the other.

Before selecting **Tools/More/MultiAdd**, you first must have created a special **map** table that tells Paradox how to transfer data from a single source table to two or more target tables. You can use **Modify/MultiEntry/SetUp** to create a map from a query statement on the workspace. If you are not familiar with maps, you should read about them in Chapter 7 before using the **MultiAdd** selection.

When using **MultiAdd**, you will be prompted for a password for the source table if it's password-protected. You will not be prompted for passwords for the map table or for any of the target tables. If you want to password-protect any of these tables, assign them the same password as the source table. Using this strategy, when the password is presented for the source table, it will unlock all of the related tables needed for the **MultiAdd** operation.

When you select **MultiAdd** from the Tools/More menu, you will be asked for the name of the single source table that contains the data you want to add to the target tables.

Source table:
Enter name of source table, or press ↵ for a list of tables.

Type in the name of the source table or press [Enter] to select the source table from a menu. The table you select must have a corresponding predefined map in order to be used as a source table.

Next, Paradox will ask for the name of the map you want to use.

```
Map table:
Enter name of map table, or press ↵ for a list of tables.
```

Type the name of the map table or press [Enter] to select it from a menu of tables. If the table you select does not have the right structure to serve as a map, or if it has not been defined for the source table, you will get an error message.

Once you have specified the source table and the map, you will see a submenu with two choices:

```
NewEntries  Update
Insert records in the source table into the target table.
```

- **NewEntries**: To add the records in the source table to the target tables without disturbing the existing records (similar to data entry)
- **Update**: To use the records in the source table to update the existing records in the target tables.

NewEntries

```
NewEntries  Update
Insert records in the source table into the target table
```

With **NewEntries**, Paradox treats the records in the source table as new records for the target tables; the effect is similar to the **MultiEntry/Entry** selection described in Chapter 7. Paradox uses the map you've specified to divide the records from the source table into separate records for each of the target tables. If any of the target tables is keyed, Paradox checks for key violations and duplicate records. If no key violations are found in a record, the appropriate portions of the original record are merged into the target table in key-field order. If a target table is not keyed, the new record is added at the end of the table.

Key Violations

When you select **NewEntries**, a key violation occurs if any of the new records has a key value that is the same as the key value in an existing record but the remaining non-key fields are **not** the same. That is, a key violation occurs if the keys are the same but the rest of the record is different.

If there is a key violation for any of the target tables, the entire source record is placed in the temporary *keyviol* table. No portion of the record will be added to any of the target tables. You can edit the records in *keyviol* to remove the key violations and then use **Tools/More/MultiAdd** once more to add the records from *keyviol* to the target tables. Remember that the *keyviol* table will be overwritten the next time key violations are found and will be erased when you exit from Paradox.

Duplicate Records

If the values in a record extracted from the source table exactly duplicate the values in an existing keyed target table record (that is, if there is a duplicate **record**, not just a duplicate key), the new record from the source will be "absorbed" by the existing target record—that is, it will neither be added nor be placed in the *keyviol table. This rule allows you to use* **MultiAdd** when the records in your target tables have one-to-many relationships without producing unwanted key violations.

Update

```
NewEntries  Update
Use the records in the source table to update the target records.
```

With **Update**, Paradox uses the records in the source table to update records in the target tables. Paradox uses the specified map to divide the records from the source table into separate records for each of the target tables. These rules are then applied to determine how to update the target records:

- If a target table is not keyed, the new records are added at the end of the table.
- If a target table is keyed, the added records are merged in key-field order.
- If a source record has the same key as an existing target record, but non-key fields in the two records are different, the non-key values of the source record are used to update the target record.

Unlike the single-table **Tools/More/Add/Update** selection, no *changed* table is generated when using **MultiAdd/Update**.

MultiAdd on a Network

When you use **Tools/More/MultiAdd** on a network, Paradox automatically places a write lock on the source and map tables and a prevent write lock on all target tables. This means that other users

- cannot modify the contents or structure of the source or map tables
- cannot perform any operation that requires a full or write lock on any target table (such as sorting)

until the records are added. If someone else on the network has started an operation that requires a full or prevent write lock on the source or map tables, or a full or write lock on any target table, you won't be able to complete the **MultiAdd** operation.

FormAdd

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Use a form to add records to one or more tables.

When you add records to tables that are logically related, it's often best to use a linked multitable form. That's because the form checks the data for referential integrity as described in "Editing Records with Multitable Forms" in Chapter 7 (Modify). For example, a multitable form won't let you enter orders for a customer that doesn't exist.

But sometimes you may be unable to use the form itself to enter records, and you end up with separate, unrelated tables. In that case, you can use **FormAdd** to add the new records to the tables through the multitable form, subject to the same data integrity checks. **FormAdd** is particularly useful:

- when the new records have been generated in a different location. For example, you may be consolidating orders from different sales regions into a single *orders* table.
- when you're using **DataEntry** with a multitable form on a network, and can't complete the operation because some of the target tables are locked. In this case, you can select **KeepEntry** from the DataEntry menu, which tells Paradox to generate separate *entry* tables for the new data. Later, when the target tables are available on the network, use **FormAdd** to complete data entry.

  In this case, remember that entry tables are temporary and will be overwritten or deleted. If you can't get access to the locked tables before you use **DataEntry** again or leave Paradox, make sure to use **Tools/Rename** to rename the *entry* tables.

FormAdd works in much the same way as **MultiAdd** described in the previous section. However, you don't need to provide a map of the corresponding fields as you do for **MultiAdd**. With **FormAdd** the form itself is the map.

Every added record must be tied to the master table. If you're entering master records that have no corresponding detail records (such as customers who haven't placed orders), Paradox accepts them. However, detail records with no corresponding master records (such as orders for which there is no customer) are ignored. Of course, they are retained in the source tables, so you'll be able to go back and add the missing data.

The records in the source tables will not be changed in any way by **FormAdd**, and a key on the

source table or tables doesn't affect the **FormAdd** process one way or the other.

When you select **FormAdd** from the Tools/More menu, Paradox asks you to name the master table and the form through which you want to add the new records. You'll be prompted for a password if required.

```
Table:
Enter name of master target table, or press ↵ for a list of tables.
```

```
F 1 2 3
Standard form
```

The master target table is the one the multitable form is associated with. Next Paradox asks where the new records are currently stored:

```
EntryTables AnyTables
Use a form to add data from one or more Entry tables to the target tables.
```

- **EntryTables**: To add the data from retained entry tables to the form
- **AnyTables**: To add the data from other tables to the form.

EntryTables

```
EntryTables AnyTables
Use a form to add data from one or more Entry tables to the target tables.
```

If you choose **EntryTables**, Paradox uses the current *entry* tables as the source for the new data. Paradox expects an *entry* table that corresponds to the master table, *entry1* for the first linked table, and so on. This is the way they're named if you used **Modify/DataEntry** to enter the new records on the multitable form, then used **KeepEntry** to save them. When you select **KeepEntry**, you'll see a *list* table naming each *entry* table and the base table with which is it associated.

When you choose **EntryTables**, Paradox adds the new records to the target tables, using the linked multirecord form as a map. By definition, *entry* tables contain new records for the target tables, not updates. This means that Paradox checks for key violations and duplicate records. If there are no key violations, the new records are merged into the target tables in key-field order.

Key Violations

A key violation occurs if any of the new records has the same key values as a record in the target table, but different values in any other fields.

When Paradox finds a key violation, it places each offending source record in one of a series of temporary tables called *keyviol*, *keyviol1*, *keyviol2*, and so on. (If a master record is a key violation, its linked detail records are also placed in *keyviol* tables.) You'll see a *list* table that relates each *keyviol* table to the base table for which the record was intended. You can edit the records in the *keyviol* tables and then use **FormAdd** again to add the records from the *keyviol* tables to the target tables. Remember that the *keyviol* tables will be overwritten the next time Paradox finds key violations, and will be erased when you exit from Paradox.

Paradox does not automatically duplicate changes that you make to one *keyviol* table in the other *keyviol* tables. If you're editing the Cust ID field, for example, you'll need to make the same change to Cust ID for each *keyviol* table in which it appears.

AnyTables

```
EntryTables AnyTables
Use a form to add data from any tables to the target tables.
```

AnyTables lets you add records from any compatible tables to the form. When you select it, you'll see a submenu with two choices:

```
NewEntries Updates
Insert records from the source tables into the target tables.
```

- **NewEntries**: To add the records in the source tables to the target form without disturbing the existing records (similar to data entry)
- **Update**: To use the records in the source tables to update the existing records in the target form.

These selections are described in the next sections. Once you've chosen how to add the records, Paradox asks you for the sources of the new data for each table associated with the form. For example:

```
Source Table:
Enter name of source for Customer Target, or press ↵ for a list of tables.
```

When you've chosen a source table for each table in the form, Paradox goes ahead and adds the records.

NewEntries

```
NewEntries Update
Insert records from the source tables into the target tables.
```

Selecting **NewEntries** tells Paradox that the source tables contain new records for the target tables, not updates. When you choose it, Paradox adds the new records to the target tables, using the linked multirecord form as a map. As with **EntryTables**, key violations are placed in *keyviol* tables and duplicate records are ignored. For details, see "Key Violations" and "Duplicate Records" in the previous section on **EntryTables**.

Update

NewEntries Update
Use source records to update existing records in the target tables.

Choosing **Update** tells Paradox to add the new records to the target tables, using any source records with duplicate key values to update existing records. The new records are added (and the existing ones updated) according to these rules:

- If a target table is not keyed, the new records are added at the end of the table.
- If a target table is keyed, the added records are merged in key-field order.
- If a source record has the same key as an existing target record but the other fields are different, the non-key values of the source record are used to update the target record.

Paradox does not generate a *changed* table when you use **FormAdd/Update**.

FormAdd on a Network

When you use **FormAdd** on a network, Paradox automatically places a write lock on all source tables and a prevent write lock on all target tables. This means that other users

- cannot modify the contents or structure of the source tables
- cannot perform any operation that requires a full or write lock (such as sorting) on any target table

until the records are added. If someone else on the network has started an operation that requires a full or prevent write lock on the source table, or a full or write lock on any target table, you won't be able to complete the **FormAdd** operation.

Subtract

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Subtract records of one table from those of another.

Subtract lets you remove from one table records that exist in another. For example, after a promotional mailing you might compile a table of customers whose letters were returned without forwarding addresses. You could use **Subtract** to remove their records from the master mailing list.

When you select **Subtract** from the Tools/More menu, Paradox will ask which table contains the records to be subtracted, and then which table they are to be removed from.

Source table:
Enter name of table with records to subtract, or press ↵ for a list of tables.

Target table:
Enter name of table from which to remove records, or press ↵ for a list of tables.

Which records are removed depends on whether the target table is keyed:

- If the target table is **not keyed**, it will lose all records that exactly match any record in the first table. (The source table will not be changed, so no data will be lost.)
- If the target table is **keyed**, it will lose all records with **key fields** that exactly match the key fields of any record in the source table.

The two tables involved in table subtraction must have **compatible** (though not necessarily identical) field types in the same order. This means that

- any kind of numeric (**N**, **$**, or **S**) field can be subtracted from another
- an alphanumeric (**A**) field of any length can be subtracted from another
- a date (**D**) field can be subtracted only from another date field.

Subtracting on a Network

When you use **Tools/More/Subtract** on a network, Paradox automatically places a full lock on both tables involved. This means that other users cannot work with them in any way until the records are subtracted. If anyone else on the network is using either table in any way, you won't be able to subtract the records until that user has finished working with it.

Empty

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Empty records from a table.

Empty removes all the records from a table. You can use it when you want to retain the structure of a table but no longer need the records it contains. It is particularly useful at the beginning of a script to empty tables used to hold or display records retrieved from a query (see Chapter 11, especially Example 11-1).

- **Caution:** *Records removed from a table with* **Tools/More/Empty** *cannot be retrieved.*

When you select **Empty** from the Tools/More menu, Paradox will ask which table to empty.

Table:
Enter name of table to empty of records, or press ↵ for a list of tables.

Before emptying the table, the program will double-check to make sure you really want to empty the table:

Cancel OK
Do not empty records from table.

- **Cancel**: To change your mind and leave the table intact
- **OK**: To tell Paradox to go ahead and empty the table.

Emptying Tables on a Network

When you use **Tools/More/Empty** on a network, Paradox automatically places a full lock on the table. This means that other users cannot work with it in any way until the records are removed. If anyone else on the network is using the table in any way, you won't be able to empty it until that user has finished working with it.

Protect

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Password-protect or write-protect a table or script, clear passwords.

The information you store in Paradox tables may be sensitive or important. **Protect** lets you secure your tables and scripts from unwanted access by others, and from accidentally being changed or overwritten.

When you choose **Protect** from the Tools/More menu, you will see three options:

Password ClearPasswords Write-protect
Set or remove passwords for a table or script.

- **Password**: To encrypt and assign security passwords to a table or script
- **ClearPasswords**: To reprotect objects by withdrawing passwords you've already presented during this session
- **Write-protect**: To prevent accidental changes to a table.

Password

Password ClearPasswords Write-protect
Set or remove passwords for a table or script.

You can use **Password** to ensure that unauthorized users cannot read or change the information you have stored in Paradox. When a table or script is password-protected, the underlying data files are encrypted (jumbled) so that they are impossible to read, even through DOS. The table or script cannot be viewed, queried, edited, played back, copied, or deleted unless the correct password is given.

With a table, in addition to an **owner** password that lets you work with it in any way, you can also set up **auxiliary** passwords that only partially unlock the table. In a multiuser environment, auxiliary passwords let you precisely control who can do what to which data. For example, you could decide that users with a particular auxiliary password cannot see certain fields, can see but not change others, can edit existing records but not enter new ones, and can record image settings but not validity checks.

You can remove password protection from a file at any time. However, you must know the owner password in order to do so.

- *Whenever you assign an owner password to a table,* **write it down** *and store it in a safe place. Without it you cannot gain access to your own password-protected table. For your security, there is no way of determining an owner password through Paradox.*

To assign a password to a table or script, select **Password** from the Tools/More/Protect menu. You will see a menu of the two kinds of objects you can protect:

```
Table  Script
Set or remove a password for a table.
```

- **Table**: To encrypt and protect a Paradox table
- **Script**: To encrypt and protect a script.

Password-Protecting a Table

As the "owner" of a table, you can limit access to it by establishing its owner password. Once you do, the table is encrypted, and no one else can access it without knowing either the owner password or an auxiliary password you define. With auxiliary passwords you can control

- access to the table itself
- access to individual fields of the table
- access to objects in the table's family.

When you select **Table**, Paradox will ask which table you want to protect:

```
Table:
Enter name of table to protect or unprotect, or press ↵ to see a list of tables.
```

Assigning an Owner Password Once you've selected a table to protect, Paradox will prompt you to enter the new owner password.

```
Password:
Enter new owner password or press ↵ to remove all passwords.
```

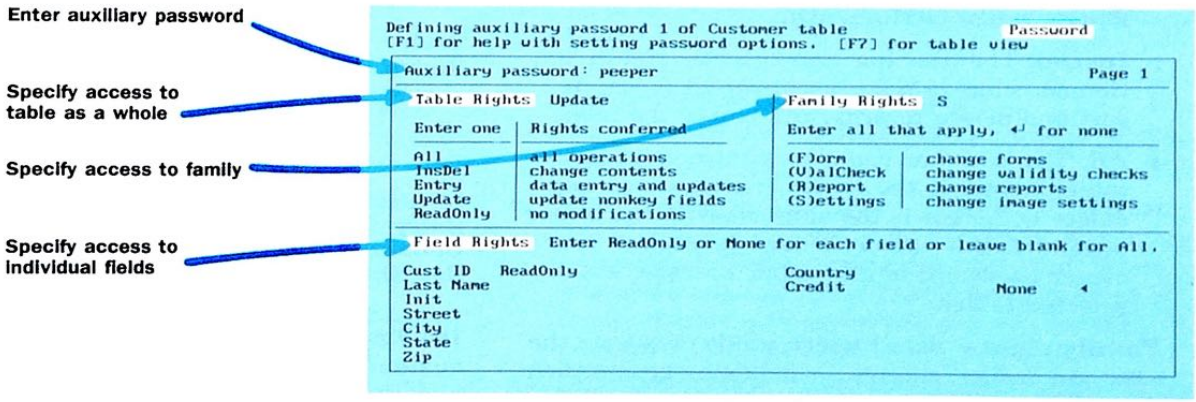
The password you type can be up to 15 characters long, including spaces. You'll be asked to enter it twice to make sure it's correct. **Remember to write down the owner password and store it in a safe place.**

Assigning Auxiliary Passwords Next you'll see a form on which you can enter auxiliary passwords for the table. You can define a virtually unlimited number of auxiliary passwords for a table, each of which confers selected privileges.

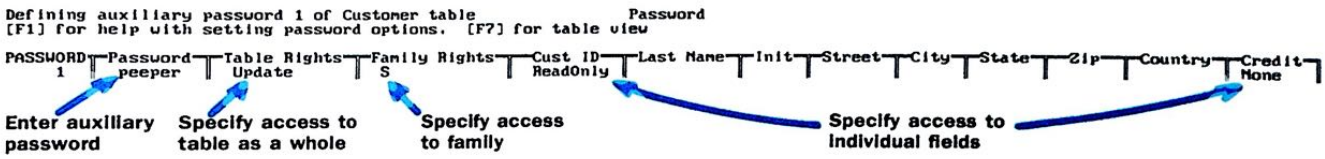
Assigning auxiliary passwords is entirely optional. If you're not working on a network, assigning an owner password in most cases will be all the protection you need. Only an owner password is necessary to protect the table and its family from all unauthorized access. If that's all you want to do, press Do-It! [F2] as soon as you see the first auxiliary password form and Paradox will assign the owner password and encrypt the table or script.

The auxiliary password screen is actually a Paradox form, and you can use it as you would use

The Auxiliary Password Form



The Auxiliary Password Table



any other form. Fill out one form for each auxiliary password, using the arrow keys, [Tab], or [Enter] to move from field to field. The form has automatic fill-in capabilities, so when a word is required you need only press its first letter.

Press [PgDn] to move to new records to establish additional passwords.

If you prefer, you can press Form Toggle [F7] and enter auxiliary passwords in table view.

The assignment process is the same whether you assign auxiliary passwords in table or form view. When you are finished, press Do-It! [F2] or select **DO-IT!** from the Password menu to assign the passwords and encrypt the table. Alternatively, you can select **Undo** or **Cancel** from the Password menu to undo your password changes.

Types of Rights The auxiliary password form has four entry areas:

- **Password**: In this field, type the auxiliary password itself, up to 15 characters.
- **Table rights**: Select one of five levels of access to the table as a whole by typing its first letter. In order of increasing access, the five levels are:
  - **ReadOnly**: The user can view the table, but cannot change it in any way.
  - **Update**: The user can view the table and change non-key fields, but cannot insert or delete records or change key fields.
  - **Entry**: The user has update rights and can enter new records by using **Modify/Data-Entry** or **Tools/More/Add.**
  - **InsDel**: The user has entry rights, and in addition can change the contents of all fields, insert and delete records, and empty the table.
  - **All**: The user has complete control over the table, including the power to restructure and delete it. Access is the same as with the owner password, but you don't need to disclose your owner password to give other users access to selected tables.
- **Family rights**: Select which kinds of objects the user can design, change, or delete by typing their first letters. You may select none, any, or all, in any order. (Users without these rights can still **use** the objects, but not change them in any way.)
  - **F**: The user can design, change, and delete forms.
  - **R**: The user can design, change, and delete reports.
  - **V**: The user can establish, change, or delete validity checks.
  - **S**: The user can establish, change, or delete image settings.
- **Field rights**: For each field, select one of two explicit levels of access by typing its first letter. If you leave the field rights specification blank for a particular field, the user holding the auxiliary password will have **all** rights to the values in that field.
  - **(Blank)**: All rights; the user can both view and change the values in the field.
  - **ReadOnly**: The user can view but not change the values in the field.
  - **None**: The user can neither see nor change the values in the field.

If a table has more than 16 fields, they will not all fit on a single form page. In such cases, the auxiliary password form will contain multiple pages for each record. You can use the [PgDn] and [PgUp] keys to move between form pages.

If you define an auxiliary password with **all** table rights, it implies that you cannot restrict access to that table's family or to any of its fields.

In addition, the level of table rights for an auxiliary password affects the allowable field rights for that table's fields. The table shows which levels of field rights are compatible with which table rights.

Compatible Levels of Field and Table Rights

Table Rights	Field rights: Minimum	Field rights: Maximum: Key fields	Field rights: Maximum: Non-Key fields
All	All	All	All
Ins/Del	All	All	All
Entry	None	All	All
Update	None	ReadOnly	All
ReadOnly	None	ReadOnly	ReadOnly

The Password Menu While you are assigning auxiliary passwords, you can press Menu [F10] to display the Password menu. It has four choices:

```
Undo  Help  DO-IT!  Cancel
Undo the last change.
```

- **Undo**: To undo the last change to the auxiliary password table
- **Help**: To obtain help about assigning auxiliary passwords

- **DO-IT!**: To finish assigning passwords, encrypt the table, and return to the main workspace (same as pressing Do-It! [F2])
- **Cancel**: To terminate assigning passwords, undo any changes made, and return to the main workspace.

In addition to these menu selections, you can press Undo [Ctrl][U] to successively undo changes you've made to the auxiliary passwords during the current session.

Changing and Removing Table Passwords To change or remove a password from a table, select **Password/Table** again from the Tools/More/Protect menu. Since the file is already protected, Paradox will then ask you to supply the current owner password (unless you have already provided it in the current session):

```
Password:
Enter password for this table to change password status.
```

Now Paradox will ask you which kind of password you want to change:

```
Owner  Auxiliary
Change owner and auxiliary passwords.
```

- **Owner**: To change or remove the owner password (and auxiliary passwords if you wish)
- **Auxiliary**: To change or remove only auxiliary passwords.

From this point on, the process is exactly the same as assigning passwords originally. If you choose **Owner**, you'll be asked to type the new owner password (twice); remember to write it down! Then you'll see the auxiliary password form. If you choose **Auxiliary**, only the auxiliary password forms will be displayed.

In either case, press Do-It! [F2] to save your changes and re-encrypt the table.

To remove all passwords, select **Owner** and, when prompted for the new owner password, simply press [Enter]. You will no longer have to give any password to access the file. When you remove the owner password, all auxiliary passwords are removed as well.

To remove an auxiliary password, press [Del] to delete its record from the auxiliary password table. To remove all auxiliary passwords, just delete all the records from the password table.

Password-Protecting a Script

Password-protecting a script is simpler than password-protecting a table since there is only one type of password (the owner password) to assign. Other users must provide the password to edit, delete, or debug the script, but not to play it.

When you select **Password/Script** from the Tools/More/Protect menu, Paradox will ask which script you want to protect:

```
Script:
Enter name of script to protect/unprotect, or press ↵ for a list of scripts.
```

Next Paradox will prompt you to enter the new password.

```
Password:
Enter new password or press ↵ to remove current password.
```

The password you type can be up to 15 characters long, including spaces. You'll be asked to enter it twice to make sure it's correct. **Remember to write down the password and store it in a safe place.**

Changing and Removing Script Passwords To change or remove a password from a script, select **Password/Script** again from the Tools/More/Protect menu. Since the script is already protected, Paradox will then ask you to supply the current password. After you type the correct password, Paradox will prompt you for the new password.

```
Password:
Enter new password or press ↵ to remove current password.
```

To change the password, just type the new one. **Remember to write it down!**

To remove the password, simply press [Enter]. You will no longer have to give the password to access the script.

Using Password-Protected Objects

Once a password is assigned to a table or script, access to it is limited.

- When a table is password-protected, no one can use it or any members of its family for any operation without first entering the password. When you try to use a protected table or associated family member, Paradox will ask you for the password. For example:

```
Password:
Enter password for this table to view it.
```

What you can do with the table depends on which password you give. If you give the owner password, you have full rights to the table. If you give an auxiliary password, your rights depend on the rights associated with that password.

- When a script is password-protected, it can still be played without giving the password. However,

no one can edit or debug it without first entering the password.

For your convenience, you only have to give the password once in each session. Once you type the correct password, you will not have to do so again during the current Paradox session—that is, until you exit from Paradox. (You may also use **Tools/More/Protect/ClearPasswords**, described in the next section, to clear the password and reprotect the table or script.)

Note that giving a password does not decrypt the protected object—it merely provides **access** to it to the password holder. Therefore, although it takes time to encrypt an object, once the encryption is complete, no extra time is required to use it.

Also, access to protected objects on a network is totally computer- or workstation-specific. If you have presented a password to the *customer* table, only you, and not other users on the network, can thereby gain access to the table. Other users who want to work with *customer* will have to present a valid password in order to use the table.

ClearPasswords

Password ClearPasswords Write-protect
Remove all access rights to protected tables and scripts.

When you present a password, Paradox remembers it for the duration of the current session. From that point on, you can use and re-use all tables and scripts protected by that password without being challenged for it again.

The disadvantage of this system is that if you need to leave your computer in the middle of a Paradox session, the tables and scripts for which you presented passwords continue to be accessible to other users who may start using the computer you were working on. This could be a problem especially on a network.

To deal with this problem, you can use the **ClearPasswords** selection to remove all passwords you presented during the current Paradox session. **When you clear the passwords, the workspace will also be cleared.**

When you select **ClearPasswords** from the Tools/More/Protect menu, Paradox will double-check to make sure you really want to clear the passwords:

Cancel OK
Do not clear passwords.

- **Cancel**: To change your mind and leave passwords in effect and the workspace intact
- **OK**: To tell Paradox to go ahead and clear all passwords and clear the workspace.

When you select **OK**, a message will confirm that all passwords have been cleared.

Write-Protect

Password ClearPasswords Write-Protect
Set or remove write protection for a table.

Write-Protect helps to prevent tables from being accidentally modified or overwritten. If you have ever inadvertently deleted a file, replaced it with another file, or removed records you wanted to keep, you will understand the benefits of write-protection. Once a file has been write-protected, it cannot be edited or deleted until write-protection has been removed.

Since write-protection can be removed by anyone at any time, it is no substitute for password protection. It merely adds an extra step to the process of changing or deleting a table—during which, presumably, the user will consider whether the table should really be changed or deleted.

To set or clear write-protection for a table, select **Write-Protect** from the Tools/More/Protect menu. Paradox will ask which table to protect.

Table:
Enter name of table, or press ↵ for a list of tables.

After you type a table name or select it from a menu, Paradox will ask whether you want to set or clear write-protection:

Set Clear
Prevent further changes to table.

- **Set**: To write-protect the table
- **Clear**: To remove write-protection from the table.

Protection on a Network

On a network, protection of tables and scripts is perhaps even more crucial than in a single-user environment because of the constant presence of other users. Note that anyone can establish an owner password—and thereby control auxiliary passwords—on an unprotected table. Thus, unless your network is completely secure and you have full confidence in the other users, you may want to set an owner password on a new table as soon as you create it. Otherwise someone else may do so first and lock you out of your own table.

When you use **Tools/More/Protect** on a network, Paradox automatically places a full lock on the table or script you are protecting. This means that other users cannot work with it in any way until the object is encrypted (or decrypted).

If anyone else on the network is using the object in any way, you won't be able to protect it until that user has finished working with it.

If you are a network administrator or application developer, you can also use the Paradox Protection Generator to set up a protection system for an entire database. See the *Network Administrator's Guide* for more information.

Directory

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Set working directory; clear workspace and delete temporary tables.

It is most convenient to work with tables and other objects that are in your **working drive and directory**. Each time you want to use an object in some other drive or directory, you must preface its name with the drive or directory name.

Normally, your working directory is also the DOS **current directory**—the one from which you started Paradox. But if you want to use objects in another directory, you can use **Directory** to change the working directory. **When you do so, the workspace will be cleared and all temporary tables will be deleted**.

When you select **Directory** from the Tools/More menu, Paradox will ask which directory you want. The present working drive and directory will already be filled in.

Directory: c:\Paradox3\
Enter new working directory specification (e.g., a:\data or b:)

Edit the drive and directory name to show the ones you want. Then press [Enter]. Before changing the working directory, Paradox will double-check to make sure you really want to do so:

Cancel OK
Do not change directories. Do not clear workspace and delete tables.

- **Cancel**: To change your mind and leave the working directory, workspace, and temporary tables intact
- **OK**: To tell Paradox to go ahead and change the working directory, clear the workspace, and delete the temporary tables.

ToDOS

Add MultiAdd FormAdd Subtract Empty Protect Directory ToDOS
Temporarily suspend Paradox and return to DOS.

Ctrl **O** **DOS**

ToDOS allows you to temporarily suspend the operation of Paradox and directly access DOS. When you select **Tools/More/ToDOS** or press DOS [Ctrl][O], the current state of Paradox is saved, and you can interact directly with DOS. This is very useful if you find that you need to perform a DOS operation, such as formatting a floppy disk or using other utility programs, in the middle of a Paradox session. When you have finished working with DOS, simply issue the DOS *exit* command, and you will be brought back to Paradox at exactly the place you left.

Alt **O** **DOS Big**

When suspended with **ToDOS** or DOS [Ctrl][O], Paradox occupies 420K bytes of memory, so your DOS activities must operate within the memory remaining. If you need more memory, use DOS Big [Alt][O] to suspend Paradox instead. This option, which saves much more of the current Paradox state to disk, takes only 100K bytes of memory, leaving you much more to work with. The only drawback to using DOS Big [Alt][O] is that it may take several seconds to reach DOS from Paradox and to reload Paradox once you exit from DOS.

While **ToDOS** is very useful, it can also be dangerous. This is so because while you are in DOS, the resource checking mechanisms that are built into Paradox to prevent data loss cannot operate. In DOS, it is possible to change the underlying state of the environment in which Paradox is running and thus cause inconsistencies or resource problems that could prevent resumption of your Paradox session.

In the worst case, if you access DOS by pressing DOS [Ctrl][O] or DOS Big [Alt][O] during the middle of an operation such as editing or creation of a form or report specification, and you change the operating environment, you could potentially lose data or corrupt a Paradox object. You could also lose data if you suspend Paradox but then fail to return to Paradox before turning off your computer.

The most important general principle to follow when using the **ToDOS**, DOS [Ctrl][O], or DOS Big [Alt][O] is this:

- *Whatever DOS disk and memory configuration existed when you suspended Paradox must be available again when you resume the Paradox session.*

  In particular, follow these rules:

- Never use DOS to delete, rename, or change any files that are in use in the suspended Paradox session. This applies particularly to the Paradox system files and to the files in which Paradox objects are stored.
- Never load any RAM resident program or any other code that could alter RAM resources while Paradox is suspended. This applies to programs

such as SideKick, ProKey, and similar products. You may access any RAM-resident programs that you loaded before the beginning of the current Paradox session.

- Never use the DOS *print* or *mode* commands while Paradox is suspended unless you have already issued them before the beginning of the current Paradox session.
- If you use DOS to change the current directory, change back to the original directory before issuing the *exit* command.
- If you change floppy disks while Paradox is suspended, restore the original disk configuration before you issue the *exit* command.
- When you are through working in DOS, resume the suspended Paradox session by typing **exit** at the DOS prompt. Never simply turn off your computer in the middle of a Paradox session.

If you are not sure whether or not a DOS operation will be safe to perform when Paradox is suspended, the best rule is: **DON'T!** You always have the option of exiting from Paradox by selecting **Exit** from the Main menu and then using DOS to complete the operation.

Scripts

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Play or record a script.

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If you perform certain Paradox operations regularly, the **Scripts** selection can save you time and effort. **Scripts** lets you record a sequence of keystrokes and play them back at any time, using only the one or two keystrokes necessary to invoke the script.

For instance, if you frequently enter sales into an *orders* table, you could write a simple script that would bring *orders* to the workspace and present you with a custom form to make order entry easier. By using the power of Paradox queries and reports, you could enhance the script to prepare invoices for the items ordered and update your inventory and receivables automatically.

You can **chain** several scripts together into one larger script. This makes it easier to build a complex script that automates a whole series of tasks. In addition, you can use **Tools/More/Protect** to password-protect scripts in order to keep sensitive data and activities secure.

But scripts do far more than duplicate the effect of keystrokes. Scripts are also the gateway to the Paradox Application Language (PAL). By enhancing Paradox scripts with PAL commands, you can create sophisticated programs and applications. You can also use the Paradox Personal Programmer to create customized applications without programming. Together, Paradox, the Paradox Personal Programmer, and PAL form a powerful environment for applications development.

This chapter describes only how to record and play Paradox scripts without using PAL or the Personal Programmer. For information about using PAL to enhance Paradox scripts, see the *PAL User's Guide*. The Personal Programmer is described in the *Guide to the Paradox Personal Programmer*.

Play BeginRecord QuerySave ShowPlay RepeatPlay Editor
Play a script.

When you choose **Scripts** from the Main menu, you'll see six choices:

- **Play**: To play a pre-recorded script or query
- **BeginRecord**: To begin recording keystrokes as a new script
- **QueryRecord**: To store the current query statement as a script
- **ShowPlay**: To play a script with full display of all recorded keystrokes
- **RepeatPlay**: To play a script a certain number of times
- **Editor**: To edit a script on the screen.

You can also use Instant Script Record [Alt][F3] and Instant Script Play [Alt][F4] to record and play a Paradox instant script.

Alt **F10** **PAL Menu**

Note that you can also record or play a script from the PAL menu, displayed by pressing PALMenu [Alt][F10]. This is useful when you're in the midst of an operation—like designing a report or custom form—in which the Main menu is not available. The **Play** and **BeginRecord** selections on the PAL menu are identical to the ones on the Scripts menu.

If there is a set of operations you perform each time you start Paradox, record them in a script called *init* in the same directory as your Paradox program files. For example, the script might change the current directory, view a certain table, or display a list of your tables. Once you have created an *init* script, Paradox will play it automatically whenever you start the program. For more on *init* scripts, see Chapter 14 (Advanced Topics).

Play

Play BeginRecord QuerySave ShowPlay RepeatPlay Editor
Play a script.

To play a previously recorded script or query, choose **Play** from the Scripts menu. Paradox will ask which script you want to play.

Script:
Enter name of script to play, or press ↵ to see a list of scripts.

Type the script name or press [Enter] and select it from a menu. If you wish, you can press [Ctrl] [Break] to stop playing a script in progress.

Play shows only the end result of the script on the screen. The intermediate steps that you have recorded will all take place invisibly.

For example, suppose a script selects **Modify/Edit** from the Main menu, chooses a table named *agents*, and moves the cursor to the last record of the table. When you run the script, you'll simply see the end result—the *agents* table in Edit mode with the cursor on the last record. If you want to see every step along the way, use **ShowPlay** (described later in this chapter) instead of **Play**. This is especially helpful when you are composing and testing scripts.

Script Errors

If something goes wrong while a script is being played, you will see the message **Script error** and a menu that contains two choices:

Cancel Debug
Stop playing script.

- **Cancel:** To stop playing the script and return to the main workspace
- **Debug:** To enter the PAL Debugger to test and revise the script.

Many script errors are **run errors** caused by playing the script in a different context than the one in which it was recorded. For example, a query script will not run properly if you're in the report generator.

If you want to use the PAL Debugger to test and revise the script, make sure to read about it in Chapter 11 of the *PAL User's Guide*.

BeginRecord

Play BeginRecord QuerySave ShowPlay RepeatPlay Editor
Begin recording a new script.

BeginRecord lets you record your keystrokes into a script. This ability to record keystrokes enables you to build modules of keystroke sequences and then chain them together for later use within other scripts as shown in Examples 11-1 and 11-2.

When you select it from the Scripts menu, Paradox will ask you to name the new script.

Script:
Enter name for new script.

Script names, like table names, can be up to eight characters long. After you type the name and press [Enter], all your keystrokes will be recorded until you choose **End-Record** to finish the script. Except when the Main menu is displayed, you will see the record indicator (**R**) in the top right corner of the screen while you're recording the script.

The Scripts Menu During Recording

While you are recording a script, all Paradox features (except recording another script!) are available to you. If you press Menu [F10], the Main menu will appear. The one difference from the menu's usual structure is in the **Scripts** selections, which now apply to the script you're creating:

Cancel End-Record Play Querysave RepeatPlay
Stop recording script without keeping it.

- **Cancel**: To stop creating the script, discard it, and return to the workspace
- **End-Record**: To finish recording the script, save it, and return to the workspace
- **Play**: To play another script or query "inside" the one you are creating
- **Querysave**: To store the query on the workspace as a new script
- **RepeatPlay**: To play a script a certain number of times.

The **Play** option is particularly important. With it you can create small modules of recorded keystroke sequences and then chain them together to create an entire application. See Examples 11-1 and 11-2 for an illustration.

Once the script is recorded, you can use **Scripts/Play**, **Scripts/ShowPlay**, or **Scripts/RepeatPlay** to play it back.

11-1. Recording a Script

Suppose that every Tuesday, as accounts manager of the Luxury Gifts department, you telephone all customers whose balances are more then 30 days old. A dummy table called *overdue* and a script called *late* could help you get the information you need as you remind them of the status of their accounts. First the script empties the dummy table. Then it queries the *accounts* and *customer* tables for the names, phone numbers, balances, due dates, and credit histories of customers with outstanding balances. Next, it transfers the information from *answer* to *overdue*. And finally, it prints the information about each customer in a report.

This script is complex enough to chain from smaller, simpler pieces. To create the final script, first create its components:

- Use **Scripts/QueryRecord** to save a query, called *30day*, that retrieves information from *accounts* and *customers* about overdue accounts.
- Use **Create/Borrow** to create a table called *overdue* to store the retrieved records. *Overdue* borrows its structure from the *answer* table of the *30day* query. (Transferring the retrieved records makes sure they aren't overwritten by another query.)
- Use **Report/Design** to create a report of the *overdue* information. Suppose this is report **R1** for *overdue*.

Clear workspace and display Main menu

Empty *overdue* table

```
ClearAll
{Tools} {More} {Empty} {Overdue} {OK}
{Scripts} {Play} {30day} Do_It!
ClearAll
{Tools} {More} {Add} {Answer} {Overdue}
Menu {Report} {Output} {Overdue} {1} {Printer}
Menu {Scripts} {End-Record}
```

Retrieve and run *30 day* query script

Clear workspace

Add records from *answer* to *overdue*

Print records on report 1

Finish script

Once these preliminaries are complete, select **Scripts/BeginRecord** to start recording the script. Then clear the workspace, retrieve and execute the *30day* query, add the retrieved records to *overdue*, and print them on report **R1**.

Once the script is recorded, you could select **Scripts/Play** to play it back. Paradox would then print the report.

This script is shown as you would see it in the Script Editor. Keywords, such as Menu and ClearAll, represent special Paradox keys (Menu is F10 and ClearAll is Alt F8) that were pressed while the script was recorded. Thewords enclosed in curly braces, such as {Tools} and {Scripts}, represent menu selections.

For more information about how recorded keystrokes are represented in scripts, see Chapter 9 of the *PAL User's Guide*.

11-2. Recording Another Script

You can also produce the 30 day report without emptying the *overdue* table. Instead, you can copy the report from *overdue* using **Tools/Copy/JustFamily** and use it with *answer*.

As in Example 11-1, create the components before creating the final script.

Clear workspace and display Main menu

```
ClearAll
{Scripts} {Play} {30day} {Do_It!}
ClearAll
{Tools} {Copy} {JustFamily} {Overdue} {Answer} {Replace}
Menu {Report} {Output} {Answer} {1} {Printer}
Menu {Scripts} {End-Record}
```

Retrieve and run *30 day* query script

Copy report from *overdue* to *answer*

Print report for *answer*

Finish script

QuerySave

Play BeginRecord QuerySave ShowPlay RepeatPlay Editor
Record the query currently on the workspace as a new script.

QuerySave lets you record the current query statement (all the query forms on the workspace) as a script. Once the query is saved, you don't have to reconstruct it each time you want to use it.

When you **Play** a query script, it will be retrieved but not executed. You can edit the query before executing it if you wish. This means you can use a query script as a "query template." For example, if you frequently link the *orders*, *customer*, and *products* tables, you could save a query containing the example elements that link them. When you retrieve the query, the linkages will already be there; you simply need to check the fields and enter the selection criteria you want.

Since **QuerySave** stores all the query forms on the workspace, you can record a query after running it. This means that you can compose a query, test it, fine-tune it, run it—and then use **QuerySave** to store it.

Before using **QuerySave**, fill out the query form(s) for the query. When you select **QuerySave** from the Scripts menu, Paradox will ask you to name the new query script.

Query script name:
Enter name to be given to new query script.

Once the query is recorded, you can use **Scripts/Play** to retrieve it. When the query is displayed on the workspace, you can modify it if you wish. Then press Do-It! [F2] to execute the query. Or you can record another script to execute the query automatically, as shown in Examples 11-1 and 11-2.

ShowPlay

Play BeginRecord QuerySave ShowPlay RepeatPlay Editor
Play a script and show each step on the screen.

When you use **Scripts/Play** to play back a script, you will see only its final results. You can use **ShowPlay** to see, step by step, the effects of every keystroke in the script. This option is useful for testing, teaching and entertainment.

When you select **ShowPlay** from the Scripts menu, Paradox will ask which script to play.

Script:
Enter name of script to play, or press ↵ to see a list of scripts.

Type the script name or press [Enter] and select it from a menu. Next Paradox will ask you to choose how fast the script should be played back:

Fast Slow
Play script rapidly.

- **Fast**: To play the script at breakneck speed
- **Slow**: To play the script at a readable speed.

If you wish, you can press [Ctrl][Break] to stop playing a script in progress.

RepeatPlay

Play BeginRecord QuerySave ShowPlay RepeatPlay Editor
Play a script a specified number of times

RepeatPlay lets you play the same script several times in a row. This is particularly useful

- for repeated macro operations, like making a change to every record in a table
- on a network, when the information in your tables is being constantly updated, and you want to continuously see the changes reflected in a query, crosstab, or graph.

For more information about using **RepeatPlay** to create an "autoregraph" system on a network, see "Using Scripts with Graphs" in Chapter 6 (Designing Graphs) of *Presenting Paradox Data*.

As with **Play**, when you use **RepeatPlay** to play back a script, you'll see only its final results. You can use **ShowPlay** to see the effects of each keystroke if you want to monitor or modify the script.

When you select **RepeatPlay** from the Scripts menu, Paradox asks for the name of the script:

```
Script:
Enter name of script to play, or press ↵ to see a list of scripts
```

Type the name or press [Enter] and select it from a menu. Then Paradox asks how many times to repeat the script:

```
Number of times to repeat:
Enter the number of times to play the script or "c" for continuous play
```

Repeating the script continuously is particularly useful when your data changes frequently, as it would during a telemarketing survey. If you need to, you can press [Ctrl][Break] to stop playing a script in progress.

Editor

Play BeginRecord QuerySave ShowPlay RepeatPlay Editor
Use the script editor to write or edit a script.

Selecting **Editor** lets you view and alter the keystrokes in a recorded script. You can use Paradox's full-screen Script Editor to move around and edit the script. You can also use the Editor to print the text of a script. The cursor and editing keys were described in "The Keyboard" (especially the fold-out diagram) and "Editing" in Chapter 2 (Fundamentals) of this manual.

Before you edit a script, however, make sure to read Chapters 9 and 10 of the *PAL User's Guide* to find out how scripts are constructed and how to use the editor.

If you prefer to edit scripts using your own word processor or text editor, you can use the Custom Configuration Program so that this menu selection directly accesses your own editor. See Chapter 14 (Advanced Topics) for full information.

Instant Scripts

Paradox's **instant script** feature is a quick way to record and play scripts.

Alt **F3** **Instant Script Record**

To begin recording an instant script, press Instant Script Record [Alt][F3]. Just as with **Scripts/BeginRecord**, an **R** (record) will appear at the top right corner of the screen while you are recording. From this point on, all your keystrokes will be recorded in a script called *instant* until you press Instant Script Record [Alt][F3] again to stop recording.

Alt **F4** **Instant Script Play**

To play the *instant* script, just press Instant Script Play [Alt][F4]. Your keystrokes will be reproduced just as you typed them.

Remember that there can be only one *instant* script at a time. The next time you use Instant Script Record [Alt][F3] to record a script, the new *instant* script will replace the old one. Therefore, to keep an instant script available permanently, use **Tools/Rename** to rename it.

Scripts on a Network

Paradox treats scripts on a network differently than other objects such as tables or reports:

- Two or more users can play a script concurrently.
- While you are editing a script other users cannot edit or play it.
- While you are playing a script others cannot edit it.

Unlike other objects, if you try to play or edit a script that another user is editing, Paradox will not tell you the name of that user. Instead, you will see a message like **Can't access script**.

Tips on Composing Scripts

With a few exceptions discussed in Chapter 2 of the *PAL User's Guide*, a Paradox script captures every keystroke you press between **BeginRecord** and **End-Record**. Thus it's important to plan how to organize the script and execute each operation. Remember that a database may not be exactly the same when the script is played back as it is when you record it.

Here are some general guidelines. Notice how they are illustrated in the *late* script in Examples 11-1 and 11-2.

- **Create small scripts.** Start by recording small script modules. Then tie them together by playing the small script while recording a larger script.
- **Keep it simple.** If a script is complex, build it from smaller, simpler scripts. In particular, if it includes any queries, store them separately with **Scripts/QuerySave.**
- **Prepare the building blocks first.** Prepare the tables, forms, or queries to hold, display, or select data before you start to record the script.
- **Start with a clear screen.** Generally, start a script by pressing Clear All [Alt][F8] to clear the workspace and display the Main menu. This helps to avoid run errors by making sure the keystrokes are always executed from the same starting point. Of course, this advice does not apply if the script will be played back entirely with Edit, Form, Report, or some other mode.
- **Empty special tables.** If you use any special tables to hold or display data (like *overdue* in Example 11-1), use **Tools/More/Empty** within your script to empty them before using them. Otherwise they may contain data from the last time the script was played.
- **Testing scripts.** If you're having trouble getting a script to work, use **Scripts/ShowPlay** to test it. Replaying the script in this way may help you see where it goes wrong.
- **Editing and enhancing scripts.** Scripts are stored in files identified by the extension **.SC** (like *late.sc*). In a script file you will find a readable sequence of the keystrokes that comprise the script. By using the Script Editor, you can edit scripts and enhance them with powerful PAL commands. See Chapter 10 of the *PAL User's Guide* for details.

Chapter 12

Help

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F1 **Help**

Pressing Help [F1] or choosing **Help** from any Paradox menu brings immediate aid in the form of a help screen. You will see information about whatever you are doing at the moment.

If the help screen doesn't contain the exact information you need, you can use Paradox's **help index** to locate an appropriate help screen. You access the help index by pressing Help [F1] from any help screen.

Help Screens

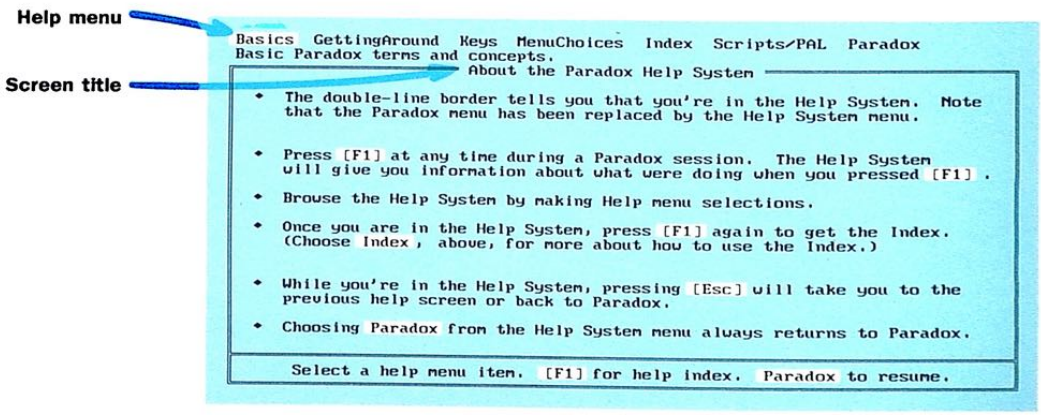
This is Paradox's initial help screen, which is displayed when you ask for help while the Main menu is displayed. Its design is typical of all Paradox help screens.

Paradox help screens are divided into three areas:

- the **title**, which shows you what subject the help screen contains information about
- the **menu**, which allows you to pick other help screen topics, or to return to your work in Paradox
- **help** about Paradox.

The help screens aren't designed to repeat the information in the Paradox manuals, only to summarize it. They can help guide you through an area of the program you aren't familiar with, or remind you about operations you haven't worked with for a while.

Inital Help screen



Help Menus

Basics GettingAround Keys MenuChoices Index Scripts/PAL Paradox
Basic Paradox terms and concepts.

Notice the Help menu at the top of the initial help screen. It contains a list of major topics—such as **Basics, GettingAround, Keys, MenuChoices, Index,** and **Scripts/PAL**—on which help is available. As you use help, the menu will change to include topics related to whatever screen you are on.

You can use the usual menu techniques to move from one help screen to another. To display information on one of the topics listed, select it from the menu. To go back to the previous screen, press [Esc].

The Help Index

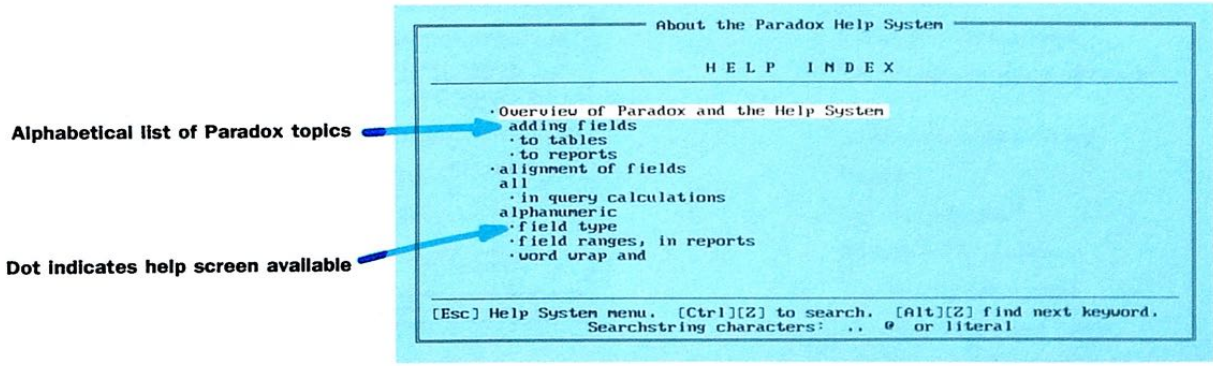
The help index is a list of Paradox topics on which help is available. Since the help screens are context sensitive, pressing Help [F1] will provide information only about the current operation. If you want additional information about the current operation or another topic, including help with the syntax of PAL commands and functions, pressing Help [F1] a second time accesses the help index.

Moving Around the Help Index

The help index gives you access to the complete range of help from any point within Paradox. Active entries in the index (that is, those that are covered by a help screen) are indicated by a · their left:
· **alignment of fields**.

Entries that are not active are general topics used to group the other entries. Once you're in the index, use [↑], [↓], [PgUp], and [PgDn] to move the cursor to the topic on which you want help, then press [Enter] to select that topic. You can also use Zoom [Ctrl][Z] and Zoom Next [Alt][Z] to quickly locate a specific topic in the index (see Chapter 8 (Image) for details).

If you want to exit the help index without selecting a topic, press [Esc]. You'll return to the last help screen you were viewing before entering the index.



12-1. Using the Help Index

Suppose you want information about **Ask** on the Main menu. Start with the Main menu on the workspace.

1. Press [F1] for the initial help screen.
2. Press [F1] again for the help index.

   The help index screen appears with the cursor on the first topic. The dot to the left indicates a help screen is available.
3. Press Zoom [Ctrl][Z] to activate Zoom.

   Paradox will ask what to search for.
4. Type **.. Ask..** and press [Enter].

   The help index highlight will move to the first entry with the text "Ask".
5. Press [Enter] to see the help screen.
6. Press [F1] to return to the index. The highlight is on the same index entry.
7. Press [Esc] to return to Paradox.

Initial help screen

```
Basics  GettingAround  Keys  MenuChoices  Index  Scripts/PAL  Paradox
Basic Paradox terms and concepts.

                    About the Paradox Help System

 • The double-line border tells you that you're in the Help System.  Note
   that the Paradox menu has been replaced by the Help System menu.

 • Press [F1] at any time during a Paradox session.  The Help System
   will give you information about what were doing when you pressed [F1].

 • Browse the Help System by making Help menu selections.

 • Once you are in the Help System, press [F1] again to get the Index.
   (Choose Index , above, for more about how to use the Index.)

 • While you're in the Help System, pressing [Esc] will take you to the
   previous help screen or back to Paradox.
```

Help index

```
                    About the Paradox Help System

                          H E L P   I N D E X

 ·Overview of Paradox and the Help System
  adding fields
   ·to tables
   ·to reports
 ·alignment of fields
```

```
                    About the Paradox Help System

                          H E L P   I N D E X

   ·word wrap and
  and
   ·in example query
   ·in math expressions
  ANSWER table
   ·description
   ·during Ask operations
   ·reports and forms
 ·arithmetic operators
   ·in calc query
 ·arrow keys
   ·in field view

[Esc] Help System menu.  [Ctrl][Z] to search.  [Alt][Z] find next keyword.
              Searchstring characters:  ..  @  or literal
```

Help screen for topic selected

```
MoreNames  Paradox
Special table names, continued.

                    Temporary Tables 1/2

 • Paradox sometimes creates temporary tables.

 • Temporary tables can be used just like any other, but they are
   overwritten each time they are needed, and are not kept at the end
   of a session.

 • During Ask operations, the following temporary tables are created:

   Table Name:   ANSWER   Contains:  results of a query
                 CHANGED              results of a ChangeTo in a query
                 DELETED              results of a Delete in a query
                 INSERTED             results of an Insert in a query

 • To save the table resulting from an Ask operation, use Tools/Rename
   to rename it.  Then it will not be overwritten in subsequent queries.

   Paradox  to resume.  [Esc] for previous menu.  [F1] for help index.
```

Special Keys in the Help System

Activating help from any point gives you access to the complete range of help. Once in the help system, the keys in the table have special functions depending on where in the help system you are.

Leaving Help

Basics GettingAround Keys MenuChoices Index Scripts/PAL Paradox
Return to Paradox.

To leave the help screens and return to whatever you were doing previously, either select **Paradox** from the Help menu or press Do-It! [F2].

	Point of Entry		
Key	**Paradox**	**Help screen**	**Help index**
[F1]	**To current help screen**	**To help index**	**To top of help tree**
[Esc]	**To previous menu or workspace**	**Up help tree or back to Paradox**	**To previous help screen**
[Enter]		**Down help tree**	**Select current entry**
[P]	**Beep**	**Back to Paradox**	**Beep**
[↑]		**Beep**	**Up help index**
[↓]		**Beep**	**Down help index**
[PgUp]			**Up one index page**
[PgDn]			**Down one index page**
Zoom [Ctrl][Z]			**Locate designated value**
Zoom Next [Alt][Z]			**Locate next occurrence of value**

Exit

View Ask Report Create Modify Image Forms Tools Scripts Help Exit
Leave Paradox (all changes have been saved for you).

Exit is used to leave Paradox and return to the operating system. When you choose **Exit** from the Main menu, Paradox will ask you to confirm that you really want to exit:

No Yes
Do not leave Paradox.

- **No**: To cancel the **Exit** selection and remain in Paradox, where you can continue working
- **Yes**: To confirm that you want to exit and return to the operating system prompt

When you leave Paradox, all tables are automatically saved for you **except for temporary tables** like *answer*, which are deleted as described under "Paradox Objects" in Chapter 2 of this manual. If you want to save the data in any temporary table, use **Tools/Rename** to rename it before you exit. You may also want to use **Tools/Copy** to back up any tables you've changed.

To ensure that all the information in your Paradox tables is properly saved, always use **Exit** to leave the program. If you exit in another way, such as turning off your computer in the middle of a session, some data may be lost.

Chapter 14

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This chapter explains how to customize Paradox to suit your computer configuration and personal work style. It also contains information that will help you optimize the performance of Paradox and the system environment in which it runs.

This chapter covers

- how to use the Custom Configuration Program to change the way certain parts of the program operate.
  - **Make sure to read this section if your screen is hard to read or contains interference ("snow").**
- Paradox's **virtual memory management** system and use of **expanded memory**
- how Paradox uses **indexes**
- how to change the **sort order**
- configuration of Paradox for
  - your computer
  - an initialization script
  - your country group.

None of this information is essential to using Paradox unless you are having trouble reading your screen. In most cases you will want to become familiar with Paradox before reading this chapter.

The Custom Configuration Program

The Custom Configuration Program (CCP) is a Paradox script that lets you customize Paradox's

- **video configuration** (type of monitor, treatment of interference, display colors)
- **report settings (report generator defaults, printer setup strings)**
- **graph settings** (graph type, title and labels, scale, colors, patterns, output)
- **default working directory**
- **international features** (number and date formatting)
- **network features** (user name, private directory, autorefresh interval)
- **other features** (Ascii conversion settings, blank value computations, automatic save, use of expanded memory, and PAL features).

Running the CCP is **entirely optional**. Unless you're having trouble reading the screen, you'll probably want to wait until you're fairly familiar with Paradox before changing any of its default settings.

The Custom Configuration Program works much like Paradox itself. You establish your custom settings by making selections from menus. If you're running Paradox for the first time and aren't sure how to select an item from a menu, see Chapter 6 (Telling Paradox What to Do) of the *Introduction to Paradox*.

Starting the Custom Configuration Program

Before you begin, make sure Paradox has been installed on your computer. For more information, see Chapter 3 (Installing Paradox) of the *Introduction to Paradox*.

- **If you have a standalone system**, the Custom Configuration Program files were automatically copied to your *\paradox3* directory when you installed Paradox.
- **If you are running Paradox on a network**, the CCP files are in the directory containing the Paradox system files; this directory is usually called *\paradox3* and is linked to a network drive. If you need help in locating this subdirectory, contact your network administrator.

Running the Program

You can run the Custom Configuration Program either from DOS or from within Paradox.

- From the DOS prompt (usually **A>** or **C>**), type **paradox3 custom.**
- While running Paradox, select **Scripts/Play** from the Main menu. Paradox will ask which script you want to play:

```
Script:
Enter name of script to play, or press ↵ to see a list of scripts.
```

- Type **custom**, or press [Enter] and select **custom** from the Script menu.

On a network the *\paradox3* directory contains the *custom* script files. Because it is a read-only directory, you cannot make this your Paradox working directory. When you start Paradox to play *custom*, you must preface its name with the name of the logical drive to which you've linked the directory containing the Paradox system files.

For example, if the Paradox system file directory is linked to drive F, and you wanted to play *custom* from the DOS command line, you would type

f:paradox3 custom

If you wanted to play *custom* from within Paradox, you would select **Scripts/Play** from the Main menu and enter **f:custom** in response to the **Script:** prompt. Or enter **f:** in response to the prompt and select *custom* from a menu.

Whichever method you use, the Custom Configuration Program will begin. If it doesn't, see the next section.

Problems

To run the Custom Configuration Program, the files CUSTOM.SC and CUSTOM.LIB must be in the correct location.

- On a hard disk system, the CCP files must be installed in your *\paradox3* directory along with the Paradox system files. If either file is missing from the directory, recopy it from the Paradox Installation Disk and try running the CCP again.
- On a network, the CCP files are in the *\paradox3* directory. Make sure to precede *custom* with the drive name when you call it. Contact your network administrator if you need help in doing this.

If Your Screen is Hard to Read

The most probable reason you might need to run the CCP before you actually start using Paradox is that you can't read highlighted text on the screen. This condition sometimes arises from connecting a black-and-white monitor to a color/graphics adapter card.

Thus, if the CCP senses that you have a color/graphics card in your computer, the first question you'll see is

```
Are you using a B&W monitor right now?
( Y for yes, N for no )
```

If you're using a black-and-white monitor, type **Y** (yes). The CCP will immediately change its internal settings so that highlighted text will be readable. If you're using a color or monochrome monitor with the appropriate adapter, type **N** (no).

In either case, the Custom Configuration Program will continue by displaying its Main menu. If the screen problem was the only reason you ran the program, select **DO-IT!** from the menu to exit back to DOS. Then restart Paradox in the usual way.

If you don't have a color/graphics card in your computer, you won't even see this question.

The Custom Configuration Menu

```
VideoReports Graphs Defaults Int'l Net PAL Ascii Help DO-IT! Cancel
Monitor, Snow, or DisplayColor
```

Next you'll see the Custom Configuration Program's Main menu which has 11 selections:

- **Video**: To specify the type of monitor you're using, set screen colors, and eliminate interference ("snow") on color monitors
- **Reports**: To change default settings in the Paradox report generator and add, change, or remove printer assignments and setup strings
- **Graphs**: To change graph settings such as type of graph, scaling, titles, and colors; and to define printer and screen settings for graphs
- **Defaults**: To set defaults for your working directory, Query Order, AutoSave, and other settings
- **Int'l**: To choose default international date or number formats
- **Net**: To set a default user name, private directory, and automatic refresh interval on a network
- **PAL**: To update indexes incrementally and link an external editor into Paradox
- **Ascii**: To change default parameters for importing and exporting Ascii files
- **Help**: To get help about customizing Paradox
- **DO-IT!**: To implement the configuration settings you've chosen and exit from the CCP (same as pressing Do-It! [F2])

- **Cancel**: To exit from the CCP without changing your existing configuration settings.

You change configuration settings by making selections from menus and answering prompts in the usual way. You can change as many settings as you like in one session with the CCP. Remember that you can always press [Esc] to retrace your steps through the previous menus or prompts.

Leaving the CCP

When you're finished changing configuration settings, press Do-It! [F2] or select **DO-IT!** from the CCP Main menu. Paradox now needs to know where to put the PARADOX3.CFG file that contains your new settings. You'll see a menu of system configurations:

```
HardDisk  Network
Write the PARADOX3.CFG file to the directory where the system files are located.
```

- **HardDisk**: To configure Paradox when you run it from a hard disk. The PARADOX3.CFG file will be written out to the directory containing the Paradox system files (\paradox3 in most cases).
- **Network**: To configure Paradox when you run it from a network file server. The PARADOX3.CFG file should be written out to your Paradox **private directory**. If your workstation has a local hard disk, your private directory should be located on the hard disk. If your workstation has no hard disk, your private directory should be your network home directory.

  The program will ask where you want the PARADOX3.CFG file. If you've previously designated it, the name of your private directory will be filled in.

```
Directory:
Enter the directory to which you want your PARADOX3.CFG file written.
```

  Type the name of your private directory and press [Enter]. **If you're not sure of the name or location of your Paradox private directory, contact your network administrator.**

Once the configuration file is created or updated, you'll see the DOS prompt again. The new settings will be in effect the next time you start Paradox.

If while running the Custom Configuration Program you decide you don't want to change the configuration settings, select **Cancel** from the CCP menu. You will exit back to Paradox without saving changes or updating the PARADOX3.CFG file.

Video

```
Video  Reports  Graphs  Defaults  Int'l  Net  PAL  Ascii  Help  DO-IT!  Cancel
Monitor, Snow, or DisplayColor
```

Video lets you optimize the way Paradox appears on your computer screen. When you select it from the CCP menu, you'll see six choices:

```
Monitor  Snow  Colors  NegativeColors  FormPalette  Return
Mono, B&W, or Color.
```

- **Monitor**: To tell Paradox what type of monitor you have
- **Snow**: To eliminate interference ("snow") on color monitors
- **Colors**: To change the colors of Paradox screen elements
- **NegativeColors**: To color negative number or currency values differently from positive ones
- **FormPalette**: To automatically display or hide a palette when colors are selected in form design
- **Return**: To preserve your changes and return to the CCP Main menu.

Monitor

```
Monitor  Snow  Colors  NegativeColors  FormPalette  Return
Mono, B&W, or Color.
```

Paradox automatically senses whether you have a monochrome, color/graphics (CGA), or enhanced graphics (EGA) adapter card installed in your computer. It then assumes that you have the usual type of monitor for the adapter—a monochrome monitor for a monochrome card or a color or enhanced color monitor for a CGA or EGA. This may not always be the case. For instance, you may be using a black-and-white monitor with a color/graphics adapter, or you may have more than one video adapter card.

When you select **Monitor** from the CCP Video menu, Paradox will ask which kind of monitor you're using:

```
Mono  B&W  Color
Monochrome monitor.
```

- **Mono**: To tell Paradox you're using a monochrome monitor with a monochrome adapter (default setting if you have only a monochrome adapter)
- **B&W**: To tell Paradox you're using a monochrome or black-and-white monitor with a CGA or EGA adapter
- **Color**: To tell Paradox you're using a color or enhanced color monitor with a CGA or EGA (default

setting if you have a CGA or EGA adapter). Notice that you don't have to distinguish between CGA and EGA cards. If you have an EGA monitor connected to a suitable card Paradox will automatically use them to display crisper characters and images.

After you select the option that corresponds to your computer setup, you'll return to the Video menu. To go back to the CCP Main menu, select **Return**. Your **Monitor** selection will take effect when you exit from the Custom Configuration Program and restart Paradox.

- **Note**: You can also indicate a type of monitor on the DOS command line when you start Paradox. See "Command Line Configuration" later in this chapter.

Snow

```
Monitor  Snow  Colors  NegativeColors  FormPalette  Return
Eliminate or allow snow with IBM Color Graphics Card.
```

If you see interference ("snow") on the screen when you use Paradox with an IBM Color/Graphics Adapter, you can use **Snow** to eliminate it. Snow will make some display operations slower.

When you select **Snow** from the CCP Video menu, Paradox will ask you whether or not you want to eliminate the snow:

```
No  Yes
Let the snow show.
```

- **No**: To tell Paradox not to remove the interference (default setting)
- **Yes**: To remove the interference.

After you select the option you want, you'll return to the Video menu. To go back to the CCP Main menu, select **Return**. Your Snow selection will take effect when you exit from the Custom Configuration Program and restart Paradox.

- **Note**: You can also tell Paradox to remove snow on the DOS command line when you start Paradox. See "Command Line Configuration" later in this chapter.

Colors

```
Monitor  Snow  Colors  NegativeColors  FormPalette  Return
Change Paradox display colors.
```

Colors lets you change the colors of a variety of Paradox screen elements including the workspace, the current menu selection, the explanation line, checkmarks, field values, and so on. Together, the collection of colors selected for the screen elements is called a color setting.

Colors also allows you to select which color combinations will correspond to the normal, reverse, high-intensity, and reverse high-intensity monochrome attributes (and vice versa) when displaying forms.

The settings in **Colors** determine what the **Paradox** screen looks like. You choose the colors for objects you create (such as forms, reports, and graphs) when you're designing them. For example:

- To color text, borders, and background on a particular form, select **Style/Color** from the Form menu when designing or changing the form.
- Use **Graphs/GraphSettings/Overall** in the Custom Configuration Program to change the default graph colors, or use **Image/Graph/Modify** for temporary changes.

Paradox comes with a default color setting, along with one or more alternate settings you can use to customize the way Paradox looks. You can select from among the supplied settings, or modify them to create your own customized look. If you modify a color setting, you can save it under a new name and use it again later.

When you select **Colors**, you'll see four choices:

```
ExistingSettings  Modify  Help  Return
Select, rename or delete a color setting.
```

- **ExistingSettings**: To select an existing color setting to modify, activate, rename, or delete
- **Modify**: To change the currently selected color setting, creating a new one
- **Help**: To get information about customizing colors
- **Return**: To finish selecting or modifying color settings and return to the Colors menu.

Paradox uses one color setting—the **active setting**—to determine the colors of the various screen elements. When you're in the Custom Configuration Program, the color setting that you're modifying is called the **current setting**.

When you first start the CCP and select **Colors**, Paradox assumes that you'll be modifying the active setting and it automatically makes that the current setting, too. There are several things you can do now:

- If you want to activate or modify a setting other than the active setting, use **ExistingSettings/Select** from the Colors menu to make it the current setting.
- If you want, you can then change the colors of the screen elements with **Modify**, and **Save** them under a new name.
- When you're finished modifying the current setting, or if you want to use it as is, select **Return**.

This saves your changes and returns to the Video menu, from which you can change other Paradox settings.

When you're finished customizing Paradox, press Do-It! [F2] or select **DO-IT!** from the CCP Main menu. This makes the current color setting active, and you will see the new colors the next time you start Paradox. The new color setting remains in effect until you use the CCP again to change it.

ExistingSettings

```
ExistingSettings  Modify  Help  Return
Select, rename or delete a color setting.
```

Selecting **ExistingSettings** from the Colors menu lets you retrieve an existing color setting, making it the current setting. You can also rename or delete a color setting you've previously saved. (You can't rename or delete one of the settings supplied with Paradox.)

When you select **ExistingSettings**, you'll see a submenu with five choices:

```
Select  ChangeName  Delete  Help  Return
Select an existing color setting to modify or make current.
```

- **Select**: To make an existing color setting the current setting so you can activate or modify it
- **ChangeName**: To rename a color setting you've previously defined
- **Delete**: To erase a color setting you've previously saved
- **Help**: To get information about selecting, renaming, and deleting settings
- **Return**: To return to the Colors menu.

When you're done using **ExistingSettings** (selecting, renaming, or deleting color settings), use **Return** to go back to the Colors menu. You can now select **Modify** to change the setting you've retrieved, or use **Return** to keep your changes and go back to the Video menu.

Select

```
Select  ChangeName  Delete  Help  Return
Select an existing color setting to modify or make current.
```

When you choose **Select**, Paradox displays a list of the existing color settings and their descriptions. The current setting is highlighted, and the active setting is preceded by an asterisk (*). It automatically becomes the current setting when you start the CCP.

```
*Default  Compaq
Default
```

Remember that when you start the CCP, the active setting automatically becomes the current setting, so if that's the one you want to modify, you don't have to use **Select**.

When you choose a setting from the menu, it becomes the current setting and you'll return to the ExistingSettings menu. You can continue to rename or delete settings, or select **Return** to go back to the Colors menu. From there:

- If you simply want to use the setting without modifying it, make it the active setting by pressing Do-It! [F2] or selecting **DO-IT!** from the CCP Main menu.
- If you want to modify it first, use **Modify** to make your changes (and save them under a new name) before selecting **DO-IT!**

The setting you've chosen will become the active setting when you exit the CCP and restart Paradox.

ChangeName

```
Select  ChangeName  Delete  Help  Return
Rename an existing setting.
```

ChangeName lets you rename a color setting you created and saved earlier. You can't rename settings supplied with Paradox.

When you select **ChangeName**, Paradox displays a menu of the existing settings and their descriptions. The current setting is highlighted, and the active setting is preceded by an asterisk (*). When you select the one you want to rename, and Paradox displays the name and prompts you to enter the new name and a description, which will appear in the menus you see when you're selecting, renaming, or deleting settings:

```
Color Setting Name:
Enter a new name for the color setting.
```

```
Description:
Describe the color setting.
```

The name can be up to 21 characters long and must begin with a letter, number, $, or #. The description can be up to 79 characters, or you can leave it blank.

After you've renamed the setting, you'll return to the ExistingSettings menu. To accept your changes and go back to the Colors menu, select Return.

Delete

```
Select  ChangeName  Delete  Help  Return
Delete a user-defined setting from the list of existing settings.
```

Delete lets you erase a color setting you created and saved earlier. You can't delete settings supplied with Paradox.

When you select **Delete**, Paradox displays a menu of the existing settings and their descriptions. The current setting is highlighted, and the active setting is preceded by an asterisk (*). Select the one you want to delete. Paradox double-checks to make sure you really want to delete it, and displays a warning message at the bottom of the screen:

```
Cancel  OK
Do not delete the current color setting.
```

- **Cancel**: To change your mind and leave the color setting intact
- **OK**: To tell Paradox to go ahead and delete the color setting.

If you delete the current setting, Paradox asks you to select another. If you don't choose one, Paradox makes the default setting active.

After you select the option you want, you'll return to the ExistingSettings menu. To accept your changes and go back to the Colors menu, select **Return**.

Modify

```
ExistingSettings  Modify  Help  Return
Modify the current color setting in order to create a new one.
```

Modify lets you change the color combinations in the current setting. When you start the CCP, Paradox's active color setting is the current one. If you want to modify another setting instead, first use **ExistingSettings/Select** to make it the current setting.

When you choose **Modify** from the Colors menu, you'll see the first of ten sample screens showing the display elements as they appear with the current color setting. These sample screens are displayed in a window occupying most of the display. The name of each screen appears at the top of the window. The sample screens are:

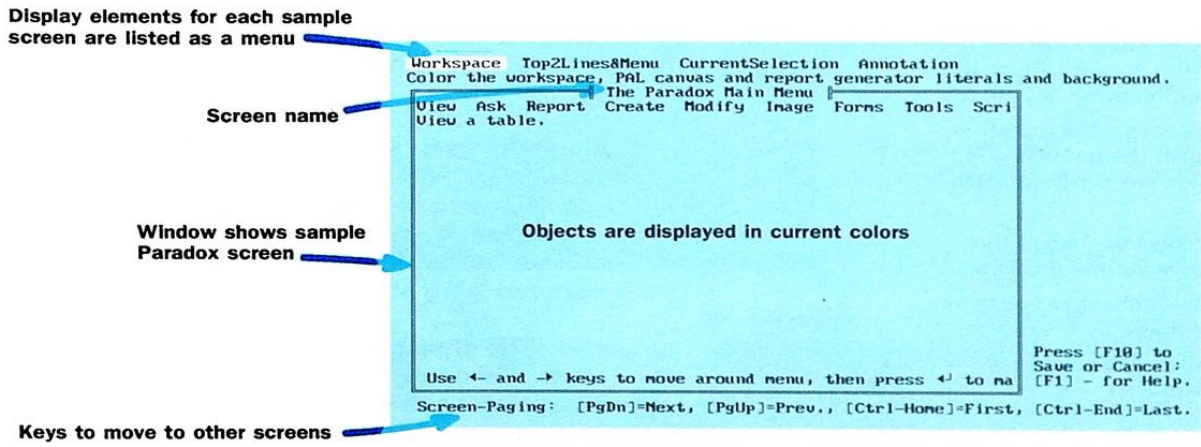
- the Paradox Main menu
- a menu prompt
- a prompted list
- query forms
- tables in Coedit mode
- the report generator
- the form generator
- a help screen
- the help index
- the PAL Debugger.

You can use PgDn and PgUp to move from screen to screen. For each of the ten screens, the menu lists the display elements you can change. In addition, a summary screen allows you to preview how the various elements from different screens will look when they appear together. (Elements from the help index, the help screen, and the form generator, which don't appear with elements from any other screen, aren't shown on the summary screen.)

At this point, you can select another element in the current screen, or select another screen showing other elements.

You can change the color of a screen element any time it appears in the window. Several display elements, such as **Workspace** and **Top2Lines&Menu**, appear in more than one sample screen. Unless you change your mind, you only need to modify them once; your modifications are carried over to the other screens. Since an element may appear in several

A Sample Color Screen



screens, however, you can check how the colors you've chosen appear in the other screens, too.

When you're working with the form generator screen, remember that you select colors for individual forms from the Form menu. In the CCP, you can choose colors for elements of the Form Designer itself, such as areas that are about to be moved and repeating areas on a multitable form, thus forming a relationship between these colors and the monochrome attributes (normal, bold, reverse video, etc.).

When you have completed your changes, you can view them in the summary screen before saving them, and then modify them again if you need to. Pressing [Ctrl][End] will take you directly to the summary screen.

After you have verified your changes, you can save them under a new name by pressing Menu [F10]. This displays a menu with two choices:

```
Save  Cancel
Save the current setting in the list of settings.
```

- **Save**: To add the modified setting to the list of existing settings.
- **Cancel**: To exit from Modify without saving any changes made during the current Modify session, and return to the Colors menu.

After you've selected an option, you'll return to the Colors menu. To save your changes and go back to the Video menu, select **Return**. Remember that the current setting will become active when you press Do-It! [F2] or select **DO-IT!** to leave the CCP.

Save

```
Save  Cancel
Save the current setting in the list of settings.
```

Save lets you store the color setting you just created so you can use it later. A maximum of 10 different color settings, including **Default** and the other supplied settings, may be stored in the list. Paradox verifies that no duplicate setting or setting name is used.

When you select **Save**, Paradox prompts you for a new name and description for the color setting, which will appear in the menus you see when you're selecting, renaming, or deleting settings:

```
Color Setting Name:
Enter a name for the new color setting.
```

```
Description:
Describe the new color setting.
```

The name can be up to 21 characters long and must begin with a letter, number, $, or #. The description can be up to 79 characters long, or you may leave it blank.

The saved setting becomes the current setting, and will be the active setting if you exit the CCP by selecting **DO-IT!** from the Main menu or by pressing Do-It! [F2].

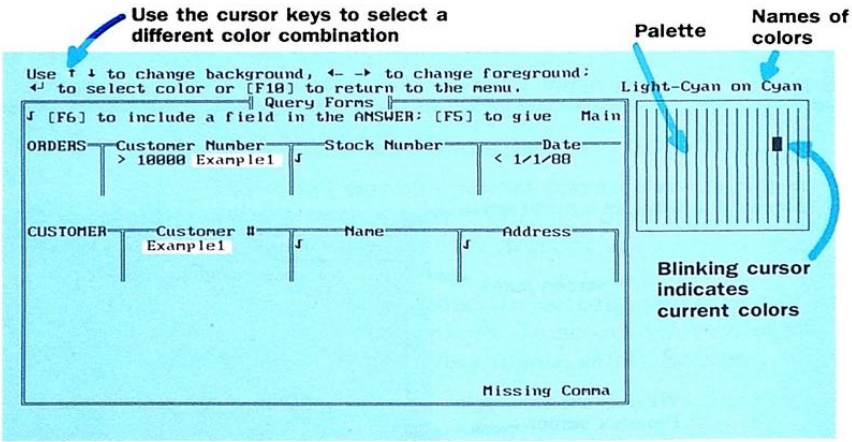
To Change the Color of a Screen Element

1. Use [PgDn] and [PgUp] to display the sample screen on which the element appears.
2. Select the element from the menu.

   When you select an element, three things happen:

   - The element you selected flashes once in the window.
   - A palette of colors appears in the top right corner of the screen, where the current color combination is blinking.
   - Instructions appear at the top of the screen, along with the name of the color combination currently selected in the palette.
3. Use the cursor keys to change the foreground and background colors.

   The selected object changes colors as you move the cursor.
4. Press [Enter] to select the color combination displayed.



After you've saved the color setting, you'll return to the Colors menu. To accept your changes and go back to the Video menu, select **Return**.

NegativeColors

Monitor Snow Colors NegativeColors FormPalette Return
Specify colors for negative numbers and currency values.

NegativeColors lets you distinguish negative numbers or currency amounts from positive ones by coloring them differently. White text on a red background is the default color setting, since red is often used to highlight losses in business reports, but you can change it by selecting **Video/Colors**, as described earlier in this section. If you use **NegativeColors** on a monochrome monitor, the negative values are highlighted with reverse video.

When you select **NegativeColors** from the Colors menu, you'll see a submenu with four choices:

BothDifferent Numbers Currency Same
Color negative number and currency values the same as positive ones.

- **BothDifferent**: To use color to distinguish negative values in both number and currency formats
- **Numbers**: To use color to distinguish negative number values only
- **Currency**: To use color to distinguish negative currency values only
- **Same**: To make negative number and currency values the same color as positive ones (preset default).

Your selection applies to negative values in both form and table view.

When you make a selection, you'll return to the Colors menu. To go back to the CCP Main menu, select **Return**. Your **Negative Colors** selection will take effect when you exit from the Custom Configuration Program and restart Paradox.

FormPalette

Monitor Snow Colors NegativeColors FormPalette Return
Specify if the color palette should be displayed during form design.

When you're designing a form, you can choose **Style/Color** from the Form menu to set colors for any area of the screen. **FormPalette** lets you decide whether or not a color palette should appear automatically in the top right corner of the screen as soon as you select **Style/Color**. Regardless of your choice, you can always press Color Palette [Alt][C] to toggle the palette on and off.

The main reason to turn the palette off is because it hides part of the form. Thus, if you prefer to see the entire area of the form you're designing, you might want to set **FormPalette** to **Off** and then use Color Palette [Alt][C] to display the palette only when you need it. Conversely, if the first thing you usually do is select the colors for some area of the form, you might want the palette displayed automatically.

When you select **FormPalette** from the CCP Video menu, you'll see a submenu with two choices:

On Off
Don't display palette when you start selecting colors during form design.

- **On**: To display the color palette
- **Off**: To hide the palette (preset default).

When you make a selection, you'll return to the Colors menu. To go back to the CCP Main menu, select **Return**. Your **Form Palette** selection will take effect when you exit from the Custom Configuration Program and restart Paradox.

Reports

Video Reports SetDirectory Int'l Network More Help DO-IT! Cancel
Change default report settings.

Reports lets you change the default report generator settings that determine how reports are formatted and printed. You can also modify the predefined setup strings that control your printer.

When you select **Reports** from the CCP menu, you'll see eight choices:

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Change the default width of the printed report page.

- **PageWidth**: To set the default number of characters in each page-width (preset default 80)
- **LengthOfPage**: To set the default number of lines on each printed page (preset default 66)
- **Margin**: To set a default left margin for reports (preset default 0)
- **Wait**: To determine whether the printer should pause between pages (preset default **No**)
- **GroupRepeats**: To choose whether repeated values in a group should be suppressed (preset default **Retain**)
- **Setups**: To add, change, or remove printer assignments and setup strings, and to select a default
- **FormFeed**: To specify whether to use formfeed or linefeed characters to skip to the top of each new page.
- **Return**: To finish defining or modifying the default report settings and return to the CCP Main menu.

For information about how these options affect printed reports, see Chapter 4 (Designing Tabular Reports) of *Presenting Paradox Data*.

PageWidth

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Change the default width of the printed report page.

PageWidth lets you set the default width of each page of your reports, in characters. When you choose it from the CCP Reports menu, the program will prompt you for the new default value.

New page width: 80
Enter the width (characters per line) for report pages.

The preset default page width (which is already filled in) is 80, which is standard for many printers as well as for the screen. If your printer has a wide carriage or you prefer a condensed type face, you may want to change this setting to 132 or some other value. You can set the default page width anywhere between 10 characters and 2000.

After you've entered the default width you want, press [Enter] to select it and return to the Reports menu. To go back to the CCP Main menu, select **Return**. Your **Page Width** selection will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember that you can choose **Settings/PageLayout/Width** from the Report Generator menu to set the page width for an individual report.

LengthOfPage

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Change the default length of the printed report page.

LengthOfPage lets you set the default number of lines that Paradox will print on one page before it begins a new one. When you choose it from the CCP Reports menu, the program will prompt you for the new default value.

New page length : 66
Enter number of lines per page.

The preset default page length (which is already filled in) is 66, which is standard for printing 6 lines per inch on an 11" page. You can set the default page length anywhere between 2 lines and 2000. You can also set the page length to C (continuous) in which the whole report is printed on one long "page." This is useful for mailing labels, checks, and other continuous-form output.

After you've entered the default length you want, press [Enter] to select it and return to the Reports menu. To go back to the CCP Main menu, select **Return**. Your page length selection will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember that you can choose **Settings/PageLayout/Length** from the Report Generator menu to set the page length for an individual report.

Margin

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Change the default left margin of the report.

Margin lets you set the default left margin for your reports. When you choose it from the CCP Reports menu, Paradox will prompt you for the new default value, in characters.

Margin size: 0
Enter the new width for the left margin.

The preset default margin (which is already filled in) is 0, which means that Paradox will start printing at the left side of the page. However, you can size the margin anywhere between 0 characters and the current page width. The setting affects only the left margin of the first page-width of your reports.

After you've entered the default margin you want, press [Enter] to select it and return to the Reports menu. To go back to the CCP Main menu, select **Return**. Your **Margin** selection will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember that you can choose **Settings/Margin** from the Report Generator menu to set the left margin for an individual report.

Wait

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Pause or continue after each page has been printed.

Wait lets you determine whether Paradox will pause after printing each page of your reports so that you can insert a new sheet of paper. When you select it from the CCP Reports menu, you will see two options:

No Yes
Do not pause after each page.

- **No**: To print reports continuously without stopping between pages (default setting)
- **Yes**: To pause at the end of each page until you press a key to continue.

The preset wait default is **No**, which means that Paradox will not pause after printing each page. You may want to set the wait default to **Yes** if you use single (cut) sheets or often print individual form letters, statements, or invoices.

After you select the option you want, you'll return to the Reports menu. To go back to the CCP

Main menu, select **Return**. Your **Wait** selection will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember that you can choose **Settings/Wait** from the Report Generator menu to change the wait setting for an individual report.

GroupRepeats

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Retain or suppress repeated group values.

GroupRepeats lets you choose whether Paradox will normally retain or suppress repeated group values. When you choose it from the CCP Reports menu, Paradox will ask which option you want:

Retain Suppress
Print all occurrences of repeated field values in a group.

- **Retain**: To print all group values, whether or not they are repeated (default setting)
- **Suppress**: To print the repeated group value for the first record only.

The preset default is **Retain**, which means that repeated group values will be shown in the printed report.

After you select the option you want, you'll return to the Reports menu. To go back to the CCP Main menu, select **Return**. Your **Group Repeats** selection will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember that you can choose **Settings/GroupRepeats** from the Report Generator menu to change the setting for an individual report.

Setups

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Specify printer port and setup strings to be used for printing reports.

Setups lets you add, delete, and change Paradox's predefined printer port assignments and setup strings (special control characters) for printing reports. The setups appear on a menu when you choose **Settings/Setup/Predefined** from the Report Generator menu.

You can also use **Setups** to choose a default setup. The default port and setup string will be used to print every report unless you use

- **Settings/Setup** from within the report generator to choose another setup for an individual report, or
- **Report/SetPrinter/Override** from the Main menu to override it for the current session.

When you choose **Setups** from the CCP Reports menu, you'll see a Paradox table called *printer* which contains the current predefined setups. The setups provided with Paradox include normal and condensed print for the IBM Graphics Printer and other popular printers. They are all directed to the LPT1 printer port.

There are four things you can do with the setups in *printer*:

- **add** strings for printers or type styles that are not already included
- **change** the name of a setup, its printer **port**, or the **characters** in the setup string
- select a **default** setup that will always be used unless you choose another setup for a particular report or session
- **eliminate** strings that are not relevant to your printers.

While editing the *printer* table, you can press Help [F1] to get more information about printer ports and setup strings.

Modifying the Printer Table

When you choose **Setups**, the *printer* table is displayed in Edit mode. You can edit *printer* just like any other Paradox table, or press Form Toggle [F7] to display it in form view. If you don't know how to edit a table, read Chapter 10 (Entering and Changing Information) in the *Introduction to Paradox*.

Printer contains three fields:

- **Name** contains a name that is used to describe each setup; the name can be whatever you like, so long as it helps you identify the setup. The entries in the Name field appear on the menu of setups in the report generator. Each setup name can be up to 20 characters long and cannot include blank spaces.
- **Port** contains the DOS device name of the port to which the report output will be directed. The only valid port names are LPT1, LPT2, LPT3, COM1, COM2, PRN, and AUX.

  If you are on a network, and will be connecting to a shared printer, you must enter the port from the perspective of your workstation (this may or may not be the same port used to actually connect the printer to the network file server). Contact your network administrator to find out which port to use for shared printers.

- **Setup String** contains the characters actually sent to the printer. Each setup string can be up to 50 characters long. To find out which characters to use, check your printer manual.

  You can type printable characters directly and convert non-printable characters (like ESC or SI) to a 3-digit Ascii value preceded by a backslash (\). For example, to enter the string *ESC 4* you'd type **\0274**. There is an Ascii conversion table in Appendix C of the *PAL User's Guide*.
  You can assign several setups to the same printer by specifying the same port for each. This lets you set up the same printer differently depending on the setup you choose.

Choosing a Default Setup String

You can designate one setup as the default by appending an asterisk (*) to its name. The default printer port will automatically be used, and the default setup string sent to it at the beginning of every report, unless you choose another setup for a particular report or session. There is no preset default setup string.

For example, to make *Small_IBMgraphcs* the default string, place an asterisk at the end of its name, like *Small_IBMgraphcs**. Of course, you can only designate one setup string as the default.

Finishing or Cancelling Changes

After you've finished adding, deleting, and modifying the setups in the table (and selected a default if you wish), press Do-It! [F2] to finish editing the table. You can also press [Esc] at any time to cancel your changes. You'll again see the CCP Reports menu. To go back to the CCP Main menu, select **Return**.

Any changes you've made will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember that you can choose **Settings/Setup** from the Report Generator menu to choose a setup for an individual report. You can also choose **Report/SetPrinter/Override** from the Main menu to choose a port and setup string for the current session.

FormFeed

PageWidth LengthOfPage Margin Wait GroupRepeats Setups FormFeed Return
Use a formfeed instead of linefeeds at the end of printer pages.

When it reaches the last line of text on a page, Paradox normally uses linefeed characters to skip to the top of the next. **FormFeed** lets you specify whether to use a formfeed character to do this instead. This is particularly useful with certain kinds of laser printers.

To select formfeeds or linefeeds, you choose:

No Yes
Do not use a formfeed instead of linefeeds at the end of printed pages.

- **No**: To use linefeeds at the end of printed pages (preset default)
- **Yes**: To use a formfeed instead.

After you select the option you want, you'll return to the Reports menu. To go back to the CCP Main menu, select **Return**. Your **FormFeed** selection will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember that you can choose **SetPrinter/Override/FormFeed** from the Paradox Report menu to choose formfeeds or linefeeds for the current session.

Graphs

Video Reports Graphs Defaults Int'l Net PAL Ascii Help DO-IT! Cancel
Modify the Paradox default graph settings.

The **Graphs** option lets you change the default settings for graphs and printers. When you select **Graphs** from the CCP Main menu, you'll see four options:

GraphSettings Printers Screen Return
Modify the current graph specification.

- **GraphSettings**: To modify the main graph settings
- **Printers**: To define up to four printers or plotters
- **Screen**: To define screen type and resolution
- **Return**: To accept your changes and return to the Graphs menu.

GraphSettings

GraphSettings Printers Screen Return
Modify the current graph specification.

Paradox comes with preset default settings for the options on the Graph Design menu. These settings, listed in Table 14-1, define the standard graph. You can use the **GraphSettings** selection on the CCP Graphs menu to change those defaults and so change the look of the standard graph. Once you save them, your new default settings remain in effect until you use the CCP to change them again.

You can change the default settings for

- the type of graph
- the scales and divisions of the axes
- the colors and patterns
- the titles and labels for your data

- the graph type of individual series elements
- where graph output should go.

For instance, suppose you often need to see your data displayed in an area graph. In that case, it would be useful to make the standard graph an area graph instead of the stacked bar graph that Paradox uses as a default. You can easily change the standard graph type in the Custom Configuration Program by selecting **Graphs/GraphSettings/Type** and pressing [A] for Area graph. Then, when you select **Return**, press Do-It! [F2] to save your CCP changes, and begin a new Paradox session, the standard graph will be an area graph.

Of course, whether or not you've changed the graph default settings, you can temporarily change the way your graphs look by selecting **Image/Graph/Modify** in Paradox itself. Changes you make using the Graph Designer remain in effect until you change them again, or until you end your Paradox session or select **Image/Graph/Reset**. These last two cause Paradox to revert to the defaults.

You can also save graph settings modified with the Graph Designer to use later. Saving and loading

Table 14-1. Default Graph Settings

Setting	Default Value
Main Settings	
GraphType	Stacked Bar
Override Types	None (all six series)
Output device	Screen
Screen type	Autosensed
Scaling	Automatic
Main Title (1)	Current table name (blank on form)
Main Title (1) size	Autosize ("default" on form)
Main Title (1) font	Automatic
Main Title (2)	Blank
Main Title (2) size	Autosize ("default" on form)
Main Title (2) font	Automatic
Legend Labels (1-6)	Field titles (blank on form)
Interior Labels (1-6)	None
X axis labels	X axis field title (blank on form)
Y axis labels	"totals" if not filled in
Axis scaling	Automatic
Low (X and Y)	0
High (X and Y)	0
Increment (X and Y)	0
Format (X and Y)	Fixed
Decimal Places (X and Y)	0
Minor Ticks (X and Y)	0
Alternate Ticks?	Yes
Display Axis Scaling?	Yes
Grid Line 1	(dotted line)
Grid Color	B (dark blue)
Frame Graph	Yes
Frame Color	B (dark blue)
Colors (Screen and Print)	
Background	H (light gray)
Main Title (1)	B (dark blue)
Main Title (2)	B (dark blue)
X Axis Title	B (dark blue)
Y Axis Title	B (dark blue)
1st Series	B (dark blue)
2nd Series	C (green)
3rd Series	D (cyan)
4th Series	E (red)
5th Series	F (magenta)
6th Series	G (brown)

Setting	Default Value
Patterns	
1st Series	A - Empty
2nd Series	B - Filled
3rd Series	C - ------
4th Series	D - Lt ///
5th Series	E - Hvy //
6th Series	F - Lt \\\
Markers	Filled Square (all six series)
Wait	Keystroke
Printer Settings and Layout	
Measurement	Inches
Left Margin	0
Top Margin	0
Graph Height	0 (page size)
Graph Width	0 (page size)
Orientation	Landscape
Break Page	No
Plotter Speed	0

Pie Settings (Screen and Printer)

Slice	Fill	Color (Screen/Print)
1st Slice	B - Filled	B (dark blue)
2nd Slice	C - ------	C (green)
3rd Slice	D - Lt ///	D (cyan)
4th Slice	E - Hvy //	E (Red)
5th Slice	F - Lt \\\	F (magenta)
6th Slice	G - Hvy \\	G (brown)
7th Slice	H - +++++++	H (light gray)
8th Slice	I - Crosshatch	I (dark gray)
9th Slice	J - Hatch	J (light blue)
Label Format:	Value	
Explode	No (all slices)	

- **Note**: The actual colors displayed may vary according to the resolution, display type, and individual settings of your color adapter.

graph settings is more convenient if you have several different graphs you commonly use.

Table 14-1 shows the default settings that come with Paradox. These settings will produce the standard graph shown in the figure.

The GraphSettings Menu

When you select **GraphSettings** from the Graphs menu, you'll see a submenu of options for customizing the standard graph. The GraphSettings menu is almost identical to the Graph Design menu described in detail in Chapter 7 (Customizing Graph Settings) of *Presenting Paradox Data*. You can refer to the appropriate section of that chapter if you need more information about one of the options on the GraphSettings menu.

Type Overall Series Pies Help Cancel Return
Change the currently specified default graph type.

- **Type**: To select the default graph type
- **Overall**: To set defaults for titles, axes, grids, colors, page layout, and output device
- **Series**: To set defaults for legends and labels, markers and patterns, and colors that affect series elements
- **Pies**: To set defaults for pie slices and labelling options
- **Help**: To get help on setting graph defaults
- **Cancel**: To cancel the current changes to graph settings and return to the Graphs menu
- **Return**: To accept the current default graph settings and return to the Graphs menu. Select **Return** twice more to return to the main CCP menu.
- **A note on forms**: Often when you make a selection from the GraphSettings menu, you'll see a form on which you can enter the new default settings. You move around in the forms by using the arrow keys, [Enter], or [Tab]. Press [Backspace] to erase characters to the left of the cursor, or [Ctrl] [Backspace] to clear a field. To store the changes you've made, select **Return** from the current menu.

Type

Type Overall Series Pies Help Cancel Return
Change the currently specified default graph type.

To choose the default type of graph to display, select **Type**. You'll see the GraphType form.

When you have finished making changes to the form, press Menu [F10] to redisplay the GraphSettings menu. You can continue to change the graph settings or select **Return** to accept the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

Overall

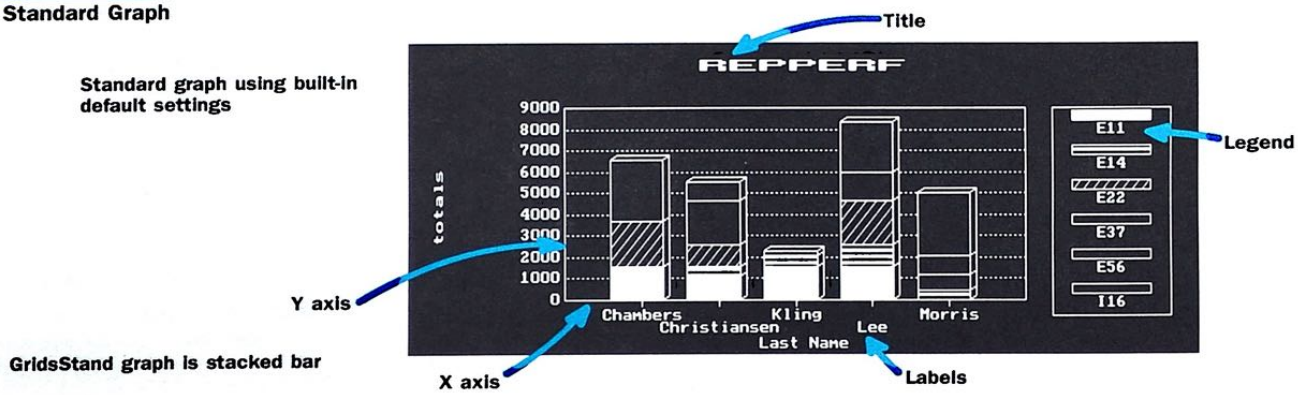
Type Overall Series Pies Help Cancel Return
Specify default titles, colors, axes, grids, printer layout, display settings.

Select **Overall** from the GraphSettings menu to set default settings that affect all types of graphs, including:

Titles Colors Axes Grids PrinterLayout Device Wait
Specify titles for the graph.

- **Titles**: To define or modify the titles for the standard graph
- **Colors**: To choose which colors to use by default on the screen or with color printers or plotters
- **Axes**: To change the default range of values used in the X axis and the Y axis, as well as how incremental values are marked on each axis

A Standard Graph



- **Grids**: To change the default colors and line types for grids and frames
- **PrinterLayout**: To define the default page layout for printers and plotters, and the default plotter speed
- **Device**: To select the default printer or plotter to use when you print a graph, or to select a default file format when you save a graph to a file
- **Wait**: To decide how long each graph will be displayed, or to display it until a key is pressed.
  - **Note**: For a pie chart, Paradox applies those settings that are appropriate, such as **Titles** and **Device**. However, you set other defaults for pie charts by selecting **Pies** from the CCP GraphSettings menu. See Pies later in this section for details.

Titles

Titles Colors Axes Grids PrinterLayout Device Wait
Specify titles for the graph.

When you select **Titles** from the Overall menu, Paradox displays the Titles form with the current defaults entered.

You can enter default values for fonts and sizes here. Also, you can set the title lines to contain a company heading or other commonly used identifier.

When you have finished making changes to the form, press Menu [F10] to redisplay the GraphSettings menu. You can continue to change the graph settings or select **Return** to accept the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

Colors

Titles Colors Axes Grids PrinterLayout Device Wait
Specify the colors to be used on the graph.

You'll find the **Colors** selection in two of the GraphSettings submenus, Overall and Series. You can use either menu option to set the default graph colors. You set the colors for pie charts separately, using **GraphSettings/Pies**.

When you select **Colors** from the Overall or Series menu, you see three options:

- **Screen**: To set the default screen display colors
- **Printer**: To set the default colors for printer output
- **Copy**: To copy the current default settings from the Screen form to the Printer form, or vice versa.

Screen
Printer

Screen Printer Copy
Specify the colors to be used to display the graph on the screen

Screen Printer Copy
Specify the colors to be used for printed output.

Selecting **Colors/Screen** or **Colors/Printer** displays the graph color options on a Paradox form. The original default settings are the same for **Screen** and **Printer**, but you can use the CCP to make them different.

- **Note**: You can also select colors for the frame and the grid lines by selecting **Grids** from the GraphSettings/Overall menu. The form you modify last will determine the new defaults.

If you are using a monochrome system you can use the **Video/Colors** selection in the Custom Configuration Program to assign the monochrome attributes available on your system to specified colors. That way, though you may not see the colors, you can still print or plot them on a color output device. For more information, see **Video/Colors** earlier in this chapter.

When you have finished making changes to the form, press Menu [F10] to redisplay the GraphSettings menu. You can continue to change the graph settings or select Return to accept the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

Copy

Screen Printer Copy
Copy the colors between the screen and the printer.

You can use this option to copy the current default settings for screen to printer, or printer to screen. This can save you having to enter the color defaults more than once, if you want them to be identical. Select **Copy** to duplicate current settings. Choose:

ScreenToPrinter PrinterToScreen
Copy the screen colors to the printer colors.

- **ScreenToPrinter**: To copy the screen settings to the printer settings
- **PrinterToScreen**: To copy the current printer settings to the screen.

Axes

Titles Colors Axes Grids PrinterLayout Device Wait
Scale, format, and label the X and Y axes.

You use the **Axes** selection to enter default scaling values, tick mark measurements, and label for-

mats. Selecting **Axes** from the Overall menu displays axis scaling and tick mark options on a Paradox form. Remember that X axis tick mark formats affect the X axis labels in X-Y graphs only.

When you have finished making changes to the form, press Menu [F10] to redisplay the GraphSettings menu. You can continue to change the graph settings or select **Return** to accept the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

Grids

Titles Colors Axes Grids PrinterLayout Device Wait
Specify the colors and format for the graph frame and grid lines.

You can change the patterns and colors of vertical and horizontal lines to make it easier to identify the position of graph elements. You can also surround a graph in a frame of a contrasting color.

When you select **Grids** from the GraphSettings menu, you see the grid and frame options on a Paradox form.

When you have finished making changes to the form, press Menu [F10] to redisplay the GraphSettings menu. You can continue to change the graph settings or select **Return** to accept the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

PrinterLayout

Titles Colors Axes Grids PrinterLayout Device Wait
Specify page layout for printed output.

Select **PrinterLayout** from the GraphSettings/Overall menu to display a Paradox form containing the layout options including measurement, orientation, page breaks, and plotter speed.

When you have finished making changes to the form, press Menu [F10] to redisplay the GraphSettings menu. You can continue to change the graph settings or select **Return** to accept the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

Device

Titles Colors Axes Grids PrinterLayout Device Wait
Specify settings to be used to print a graph or send output to a file.

When you select **Device**, you see two options. Choose:

Printer File
Select an output device on which to print the graph.

- **Printer**: To select the default printer or plotter to use when you print a graph
- **File**: To choose the default file type to use when saving a printer output file.

Printer

Printer File
Select an output device on which to print the graph.

Device/Printer lets you select one of four defined printers as the default printer.

1stPrinter 2ndPrinter 3rdPrinter 4thPrinter
Send graph to IBM Graphics Printer.

- **Note**: If you have already used the CCP **Graphs/Printer** selection to define printers, the menu will display the name of the printer defined. For example, the explanation line above shows that you've defined the 1stPrinter as an IBM Graphics Printer. If you have not defined a choice, its explanation line will read **Send graph to Undefined**.

Unless you use the Graph Design menu to override it, this is the printer Paradox will use when you select **ViewGraph/Printer/Print** to print the image.

- This setting also determines the format Paradox uses when you select **ViewGraph/Printer/File** to save a printer output file—if you have also selected CurrentPrinter from the Device/File menu (see the next section for information on file types).

You use the **Device/Printer** selection to choose which printer to use as the default or active printer. You define the first, second, third, and fourth printers by selecting the **Printer** from the CCP Graphs menu, as explained later in this chapter.

File

Printer File
Specify output device settings for sending graph to a file.

Device/File lets you choose the default format to use when you save an image of your graph for use with other graphics applications.

CurrentPrinter EPS PIC
Format file output using specs for IBM Graphics Printer.

- **CurrentPrinter**: To save the file in a .grf file, using the settings of the currently selected printer which is named on the explanation line (preset default)
- **EPS**: To save the file in Encapsulated PostScript (.eps) format
- **PIC**: To save the file in Lotus .pic format, a standard used by many applications.

Wait

Titles Colors Axes Grids PrinterLayout Device **Wait**
Specify waiting period for displaying a graph.

You can decide how long a graph should be displayed on the screen, and whether to require a keystroke before returning to the workspace. When you choose **Wait** from the GraphSettings/Overall menu, you can select a new default:

Keystroke Duration
Wait for a keystroke to return to the workspace after the graph is displayed.

- **Keystroke**: To display a graph until a key is pressed (original default setting)
- **Duration**: To define the length of time the graph should remain on the screen.

When you select **Duration** Paradox will prompt you to enter a time (in seconds):

Number of seconds to wait:
Enter number of seconds to wait after graph is displayed or ↵ for no wait.

If you enter zero, or no value at all, there will be no delay; Paradox will return to table view as soon as the graph is displayed. This is the setting to use if you frequently will be using Paradox's autoregraph feature on a network. However, if you make zero the default setting, you'll have to change it interactively during each Paradox session whenever you want to view individual graphs on the screen.

Series

Type Overall **Series** Pies Help Cancel Return
Specify legends and labels, markers and fills, and series colors.

When you select **Series** from the GraphSettings menu, Paradox displays the Series menu. Select:

- **LegendsAndLabels**: To define default legends and interior labels
- **MarkersAndFills**: To select default markers and fill patterns for points and bars
- **Colors**: To choose which colors to use by default on the screen or with color printers or plotters (same as **GraphSettings/Overall/Colors**).

In each case, when you have finished making changes to the form, press Menu F10 to redisplay the GraphSettings menu. You can continue to change the graph settings or select **Return** to accept the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

LegendsAndLabels

LegendsAndLabels MarkersAndFills Colors
Specify legends and labels for graph series.

Selecting **LegendsAndLabels** displays the default options for legends and interior labels on a Paradox form.

MarkersAndFills

LegendsAndLabels **MarkersAndFills** Colors
Specify markers and fills for graph series.

Selecting **MarkersAndFills** displays the default marker and fill pattern options on a Paradox form.

Colors

LegendsAndLabels MarkersAndFills **Colors**
Specify colors to be used for each series.

You can select **Colors** from the GraphSettings/Series menu to define printer and screen color defaults. The selection is the same as **Colors** on the GraphSettings/Overall menu, so for more information refer to **Overall/Colors** earlier in this chapter.

Pies

Type Overall Series **Pies** Help Cancel Return
Specify default settings for pie charts.

Unlike the other **Graph/Modify** options, which, in most cases, apply to all graph types, the **Pies** options apply only to pie charts. They are ignored if the current graph is any other type.

Selecting **Pies** displays a Paradox form on which you choose the default label format, fill patterns and colors, printer colors, and whether or not to explode slices of the pie.

When you have finished making changes to the form, press Menu F10 to redisplay the GraphSettings menu. You can continue to change the graph settings or select **Return** to save the settings and return to the Graphs menu. Your changes will take effect once you leave the CCP and start Paradox again.

Printers

GraphSettings **Printers** Screen Return
Set specifications for graphics printers.

When you print a graph or choose a default printer, Paradox refers to your printers by number: 1stPrinter, 2ndPrinter, etc. The CCP **Graphs/Printers** selection is where you define each of these printers—that is, tell Paradox what kind of printer or plotter it is, what port it's connected to, and what its settings should be. Graph printer assignments are independent of the printer assignments made in the

CCP Reports/Setup menu, although the same printer can be assigned in both places if you want to use it to print both reports and graphs.

When you select **Printers** from the Graphs menu, you see a submenu of the four printers you can define:

```
1stPrinter  2ndPrinter  3rdPrinter  4thPrinter
Choose or make changes to Printer 1 specifications.
```

The options available for each printer assignment are identical.

- Moving through CCP printer menus: Use arrow keys to select one of the choices in each menu and press [Enter] to select that choice. [Esc] will cancel your choice and return you to the previous menu.

Each of the numbered printer selections lets you add a printer or change the printer assignment.

When you select the printer you want from the Graph/Printers menu, you'll see two options:

- **TypeOfPrinter**: To select the make, model, and mode of operation for the first printer
- **Settings: To determine the port assignment, communications settings (if necessary), and paper type for the first printer.**

TypeOfPrinter

```
TypeOfPrinter  Settings  Return
Choose manufacturer, model and mode for Printer 1.
```

When you select **TypeOfPrinter**, you'll see Paradox forms containing lists of printer manufacturers and printer models. You may also see a form on which you can choose among several modes of print (like expanded or compressed).

```
Move to the model to be selected
Press [Enter] to select the model: Press [Esc] for previous screen
 Selecting a Graphics printer
  PRINTER 1                          HP PaintJet
                                     HP LaserJet        (75 dpi)
  Choose a graphics printer from the HP LaserJet Plus   (150 dpi)
  list at the right of the screen.   HP LaserJet II     (300 dpi)
  First find the company that makes
  your printer, then the printer
  model, and finally the mode.

  The current selection is listed
  in the fields below.

  Manufacturer:
  HP Printers

  Model:
  *

  Mode:
```

Use arrow keys to move the cursor to your selection

Press [Enter] to accept that selection

Press [Esc] to leave the selection unchanged

```
Move to the MANUFACTURER to be selected
Press [Enter] to select the MANUFACTURER: Press [Esc] for previous screen
 Selecting a Graphics printer
  PRINTER 1                          ALPS
                                     Apple
  Choose a graphics printer from the C. Itoh
  list at the right of the screen.   Calcomp
  First find the company that makes  Canon
  your printer, then the printer     Citizen
  model, and finally the mode.       Epson
                                     Fujitsu
  The current selection is listed    HP Printers
  in the fields below.               HP Plotters
                                     IBM
                                     Lotus .PIC Output
  Manufacturer:                      Mannesmann Tally
  HP Printers                        NEC
                                     Okidata
  Model:                             Olivetti
  HP LaserJet II    (300 dpi)        Panasonic
                                     Quadram
  Mode:                              Star Micronics
  300 x 300 dpi                      Tandy
                                     Texas Instruments
```

```
Move to the mode to be selected
Press [Enter] to select the mode: Press [Esc] for previous screen
 Selecting a Graphics printer
  PRINTER 1                           75 x  75 dpi
                                     100 x 100 dpi
  Choose a graphics printer from the 150 x 150 dpi
  list at the right of the screen.   300 x 300 dpi
  First find the company that makes
  your printer, then the printer
  model, and finally the mode.

  The current selection is listed
  in the fields below.

  Manufacturer:
  HP Printers

  Model:
  HP LaserJet II    (300 dpi)

  Mode:
  *
```

Settings

TypeOfPrinter Settings Return
Choose the device and whether to pause between pages.

Choose **Settings** from the 1stPrinter menu to choose the printer port to use for the current printer assignment and whether or not to pause between printed pages. You'll see a submenu with two choices:

Device PrinterWait
Choose the device for Printer 1.

- **Device**: To choose the printer port and serial communications parameters, if appropriate
- **PrinterWait**: To decide whether to pause between pages.

Device

Device PrinterWait
Choose the device for Printer 1.

Device lets you choose the printer port to use with the current printer assignment. You'll see a submenu displaying the names of the printer ports:

Parallel1 Parallel2 Serial1 Serial2 LPT1 LPT2 LPT3 LPT4 EPT
The device is Parallel1.

In most cases, **LPT1** and **Parallel1** are the same. Sometimes on a network the output of **LPT1** or **LPT2** is redirected. In those cases it's important to know that Parallel1 and Parallel2 are always the local parallel ports. EPT is a special setting for the IBM Page Printer. See your DOS manual for more information about printer ports.

If you choose anything other than one of the parallel ports, you'll see another submenu to set the serial communications parameters:

Baud Parity Stopbits Return
Choose the baud rate for your Printer 1 device.

- **Baud**: To select the serial communications speed, in bits per second, from a menu of baud rates ranging from 110 to 19200. The **Leave** option lets you leave the baud rate unchanged.
- **Parity**: To select the communications parity from a menu that includes **No** (for no parity), Even (for even parity), *Odd* (for odd parity), and **Leave** (to leave the parity unchanged).
- **Stopbits**: To select how many bits to use to delimit each byte, from a menu of two options: **1** and **2**.
- **Return**: To accept your changes and return to the Device menu.

PrinterWait

Device PrinterWait
Choose whether to pause between pages on printer1.

For each defined printer, **PrinterWait** lets you pause between pages or allow continuous printing. The default setting is **No**. To pause between pages, select **Yes** from the menu.

Screen

Graphsettings Printers Screen Return
Set specifications for graphics display.

Paradox automatically senses the kind of monitor you are using and normally uses the highest resolution available to display graphs. For instance, if you have an advanced graphics adapter that supports CGA, EGA, and VGA color graphics, Paradox will automatically use VGA to display graphs unless you change the setting here.

The **Screen** selection lets you change the default screen display used for graphs.

If you select **Auto**, Paradox will check your system and determine the display type and resolution automatically. **Auto** is the preferred setting. Do not attempt to select a resolution for a display type or resolution you don't have. If you are unsure, always select **Auto**.

If a display type can display more than one resolution, a submenu will appear. For instance, when you select **CGA** from the Screen menu, you will see a submenu of CGA resolutions:

CGAC0 CGAC1 CGAC2 CGAC3 CGAHI
Color Graphics Adapter, 320 x 200 Color Set 0.

Defaults

Video Reports Graphs Defaults Int'l Net PAL Ascii Help DO-IT! Cancel
SetDirectory, QueryOrder, Blank=Zero, EMS, AutoSave, and DisableBreak.

Defaults lets you customize several of Paradox's standard settings. When you choose **Defaults** you'll see a submenu with seven options:

SetDirectory QueryOrder Blank=Zero EMS AutoSave DisableBreak Return
Set your DOS working directory.

- **SetDirectory**: To set up a default working directory for your Paradox data
- **QueryOrder**: To choose whether the fields in a query result should be arranged according to their position in the table structures or in the query forms
- **Blank=Zero**: To tell Paradox whether or not to treat blank values in numeric fields as 0 in calculations

- **EMS**: To tell Paradox how to allocate its expanded memory resources
- **AutoSave**: To adjust the frequency of Paradox's automatic saves to disk during edit and data entry operations
- **DisableBreak**: To prevent [Ctrl][Break] from exiting from Paradox subsystems
- **Return**: To preserve your changes and return to the CCP Main menu.

SetDirectory

SetDirectory QueryOrder Blank=Zero EMS AutoSave DisableBreak Return
Set your DOS working directory.

It's most convenient to work with tables and other objects in your **working drive and directory**. You can use **SetDirectory** to set a default working directory for your Paradox objects. Once you set a default working directory through the CCP, Paradox will automatically switch to the default directory when you start the program, no matter which directory you are connected to when you start. Of course, you can also use **Tools/More/Directory** (see Chapter 10) to change the working directory during a Paradox session.

When you select **SetDirectory** from the Defaults menu, Paradox will ask which directory you want to designate as the default. The working drive and directory currently specified in PARADOX3.CFG will already be filled in.

Directory:
Enter new DOS working directory specifications (e.g. c:\ data or b:).

After you've entered the default working directory you want, press [Enter] to select it and return to the Defaults menu. To go back to the CCP Main menu, select **Return**. The default working directory you've designated will take effect when you exit from the Custom Configuration Program and restart Paradox.

QueryOrder

SetDirectory QueryOrder Blank=Zero EMS AutoSave DisableBreak Return
Specify the display and sort order for the Answer table.

In a query result, by default, checked fields are displayed in the sequence in which they appear in the tables represented by the query forms. Pressing Rotate [Ctrl][R] to rearrange the fields of the query form, as described in Chapter 10 (Image), does not affect the ordering of fields in the result.

QueryOrder lets you choose whether to make the *answer* table sensitive to rotation. When you select it from the CCP Defaults menu, you'll see two choices:

ImageOrder TableOrder
Order the fields of Answer according to their table order.

- **ImageOrder**: To arrange the fields of *answer* according to their position in the query forms.
- **TableOrder**: To arrange the fields of *answer* according to their position in the underlying table structures

If you set **ImageOrder** as the default, the fields of answer tables will be displayed in the same order they appear in the (rotated) query forms. In addition, when you play query scripts, fields that are checked or contain selection conditions, example elements, or expressions will always appear at the beginning of the query forms.

ImageOrder is especially useful for graphs and crosstabs. However, it can cause problems for operations that require identical or compatible table structures. These include

- **Tools/Copy/Form**, **Report**, and **JustFamily**
- **Tools/More/Add** and **Subtract**
- **Tools/More/FormAdd**.

For example, suppose you've performed a query and want to present the results in a report. In this case it's best to rename the *answer* table since otherwise it (and the report) will be lost the next time you perform a query. Once the table is renamed, if you perform the original query again, you can use **Tools/Copy/Report** to apply the report to the *answer* table. However, if the *answer* table has a different structure because you've rotated the query forms, it will no longer be compatible with the report.

Blank=Zero

SetDirectory QueryOrder Blank=Zero EMS AutoSave DisableBreak Return
Choose whether or not to treat blanks as zeros.

Normally, if the value of a numeric field used in a calculated expression is blank, the result of the calculation will also be blank. **Blank=Zero** lets you treat blank numeric values as having a value of zero in various Paradox calculations.

This is useful, for example, when you use an expression like [**Quant**] * [**Price**] * (**1-** [**Discount**]) to calculate the total amount of an order in a report. In this instance, without having blanks treated as zeros, if the Discount field was left blank because no discount was given to a particular customer, Paradox would not calculate the total amount of that customer's order.

When you set **Blank=Zero/Yes** Paradox treats blanks as zeros in the following contexts:

- Calculated fields in reports

- Calculated fields in forms
- Calculations in queries not having to do with counting
- PAL calculations not having to do with counting

The meaning of a blank value is often ambiguous. A blank could stand for a numeric value of zero, or it could mean that the value of a particular field is not known. There is a potential for a confusion of these two possible meanings that could sometimes lead to inaccurate results.

For example, look at the values in the following table.

PRODUCTS	Stock #	Description	Quant	Price
5	422	Platinum snuff box	80	139,994.40
6	519	Robot-valet	50	167,994.40
7	550	Digital grandfather clock	266	5,344.65
8	890	Matching panthers/leashes	3	420,000.00
9	919	Underwater Pen		

Blank value

As you can see, there is a missing Price value for the Underwater pen. The reason is that you haven't yet priced this item. Suppose you have selected **Blank=Zero/Yes**. Now let's say you want to apply a fixed handling surcharge of $100.00 to the price of all of your products. You could make this change using a *Changeto* query. What will the result of this calculation be?

Price + surcharge

PRODUCTS	Stock #	Description	Quant	Price
5	422	Platinum snuff box	80	140,094.40
6	519	Robot-valet	50	168,094.40
7	550	Digital grandfather clock	266	5,444.65
8	890	Matching panthers/leashes	3	420,100.00
9	919	Underwater Pen		100.00

Incorrect result

The price of the Underwater pen has been changed to $100.00—an incorrect amount. (If you had applied a **percentage** increase, the result would not have been misleading, because multiplying 0 by any amount always results in 0.)

Because of the potential for confusion and misleading results, if a value is really 0, it is preferable to explicitly enter 0 (rather than having a blank stand for 0) and leave a field blank only when there is no value to enter.

When you select **Blank=Zero** from the CCP Defaults menu, you'll see a submenu with two options.

```
No  Yes
Ignore blanks in arithmetic operations.
```

- **No**: To return blank results when a calculation is based on a blank value (preset default value)
- **Yes**: To treat blank values as 0 in calculations.

After you've selected a treatment for blank values, you'll return to the CCP Defaults menu. To go back to the CCP Main menu, select **Return**. Your **Blank=Zero** selection will take effect when you exit from the Custom Configuration Program and restart Paradox.

EMS

```
SetDirectory  QueryOrder  Blank=Zero  EMS  AutoSave  DisableBreak  Return
Specify percentage of EMS to be allocated to the disk cache.
```

EMS lets you change the way Paradox allocates expanded memory resources. An expanded board such as the Intel Above Board or the AST Rampage can dramatically increase Paradox's performance. Paradox takes advantage of any expanded memory automatically.

As explained in "Expanded Memory" later in this chapter, Paradox divides expanded memory into three areas:

- the virtual memory management system (VMM)
- a temporary storage area that holds recently-used Paradox overlays and PAL procedures
- a disk cache that will automatically store files accessed from disk during your Paradox session.

Paradox always allocates the first 48K of EMS or the first 208K of EEMS to the VMM. This allocation can't be altered.

If more expanded memory is available, Paradox allocates the next 192K to the temporary storage and then divides the remainder between the temporary storage area (25%) and the cache (75%). However, you can use **EMS** to change this allocation.

When you select **EMS** from the CCP Defaults Menu, Paradox asks how much expanded memory to assign to the disk cache.

```
Percent allocated to cache:
Enter percentage of expanded memory for cache. Leave blank for default.
```

Type the percentage of expanded memory to allocate to the cache as a number between 0 and 100. Then press [Enter]. The remaining expanded memory will be allocated to the temporary storage area. If you want to disable Paradox's automatic disk caching, enter **0**.

In choosing a percentage, remember that this allocation is made **after** the initial, fixed allocation to the VMM. Also, if you enter a percentage, the default initial 192K allocation to the temporary storage area is not made; the percentage you enter here is all that is assigned to it.

It is usually satisfactory to allow Paradox to allocate expanded memory resources according to the built-in default settings. Depending upon your application and style of working, and the amount of expanded memory you have available, you may want to experiment to try to find a faster-performing allocation scheme. For example, if you are typically work-

ing with very large Paradox tables, it may be advantageous to increase the allocation of memory to the disk cache.

After you've decided how to allocate expanded memory, you'll return to the CCP Defaults Menu. Your allocation percentage will take effect when you exit from the Custom Configuration Program and restart Paradox.

You can also determine the proportion of total available expanded memory that will be used by Paradox. See "Command Line Configuration" later in this chapter.

For detailed information about how Paradox uses expanded memory, including special notes for AST Rampage Users, see "Expanded Memory" later in this chapter.

AutoSave

SetDirectory QueryOrder Blank=Zero EMS AutoSave DisableBreak Return
Enable or disable frequent automatic saving to disk.

AutoSave lets you adjust the frequency of Paradox's automatic saves to disk during edit and data entry operations.

While you are editing or entering records, Paradox's virtual memory management system occasionally saves your changes to disk automatically (see "How Paradox Manages Memory" later in this chapter). This helps reduce the amount of data you might lose in a power failure or similar mishap.

AutoSave further reduces potential data loss by taking advantage of the time between your keystrokes to save even more frequently. The saves are automatically adjusted to your rate of typing. When Paradox notices that you have not been typing for a while, it will begin to save your changes out to disk more frequently.

Of course, you can still use **Cancel** to cancel your changes or **Undo** to undo them incrementally. The only potential disadvantage to the autosave feature could be a slight occasional lapse of responsiveness to your typing if you are using Paradox on a two-floppy system. On a hard-disk system, you should notice no performance difference whether autosave is on or off. By default, **AutoSave** is turned on. When you choose **AutoSave** from the CCP Defaults Menu, Paradox will ask whether you want to set autosave on or off.

No Yes
Enable frequent automatic saving to disk.

- **No**: To autosave occasionally
- **Yes**: To autosave frequently, adjusted to your rate of typing (preset default setting).

After you've selected an autosave option, you'll return to the CCP Defaults Menu. To go back to the CCP Main menu, select **Return**. Your autosave option will take effect when you exit from the Custom Configuration Program and restart Paradox.

DisableBreak

SetDirectory QueryOrder Blank=Zero EMS AutoSave DisableBreak Return
Set your DOS working directory.

Normally, when you use Paradox, you can use [Ctrl][Break] to interrupt the current operation and return to the previous one. However, due to problems with some networks and international keyboard drivers, certain other key sequences can also produce the effect of [Ctrl][Break]. For example, several European keyboard drivers produce a [Ctrl][Break] during incomplete key sequences involving accent keys like Accent Acute and Accent Grave. This could potentially cause you to lose changes to data or objects if the unintended [Ctrl][Break] cancels a mode (subsystem) like Edit or Report.

Since several European keyboard drivers share this problem, [Ctrl][Break] is automatically disabled for you when you install Paradox and select the European country group. If your European keyboard operates correctly, you can use the **Enable** setting to turn on [Ctrl][Break].

DisableBreak changes the operation of [Ctrl][Break] only when it would exit from a subsystem. Its effect during other operations, such as cancelling query or sort processing, is unaffected.

When you select **DisableBreak** from the CCP Defaults menu, you will see a submenu with two choices:

Enable Disable
Turn on [Ctrl][Break] for all operations.

- **Enable**: To make [Ctrl][Break] active for all Paradox operations (default when installed for all country groups except European)
- **Disable**: To disable [Ctrl][Break] for exiting from subsystems like Edit and DataEntry (default when installed for European country group).

After you've selected a [Ctrl][Break] setting, you'll return to the CCP Defaults menu. To go back to the CCP Main menu, select **Return**. Your **DisableBreak** selection will take effect when you exit from the Custom Configuration Program and restart Paradox.

Int'l

Video Reports Graphs Defaults Int'l Net PAL Ascii Help DO-IT! Cancel
Set international number and date formats.

When you install Paradox, default date and number formats for screen display and for report output

are selected automatically. These settings are used each time you start Paradox. The formats that are used depend on the country group that was chosen during the installation process, as described in "Configuring Paradox" later in this chapter.

Int'l lets you change the default date and number formats. When you choose it from the CCP Main menu, you'll see three choices.

```
DateFormat  NumberFormat  Return
Specify the format to use for dates.
```

- **DateFormat**: To select a default format for displaying dates
- **NumberFormat**: To select a default format for displaying numbers
- **Return**: To preserve your changes and return to the CCP Main menu.

DateFormat

```
DateFormat  NumberFormat  Return
Specify the default format to use for dates.
```

DateFormat lets you choose one of Paradox's three on-screen date formats as the default for both screen display and report output. When you choose it from the CCP Int'l menu, you'll see the three choices:

```
1) mm/dd/yy  2) dd-Mon-yy  3) dd.mm.yy
Set date format to mm/dd/yy (e.g. 12/25/86).
```

- **1) mm/dd/yy**: To display dates like 8/24/88
- **2) dd-Mon-yy**: To display dates like 24-Aug-88
- **3) dd.mm.yy**: To display dates like 24.8.88.

After you've selected the default date format you want, you'll return to the Int'l menu. To go back to the CCP Main menu, select **Return**. Your default date format will take effect when you exit from the Custom Configuration Program and restart Paradox.

Remember that you can choose **Image/Format** to change the on-screen date format for individual columns in a table, and then use **Image/Keep-Settings** to save the revised formats (see Chapter 8 for details). In the report generator, you can select one of eleven formats for a date field when you place it or select **Field/Reformat** from the Report Generator menu (see Chapter 4 of *Presenting Paradox Data*).

NumberFormat

```
DateFormat  NumberFormat  Return
Specify the format to use for numbers and currency.
```

NumberFormat lets you choose one of two standard formats as the default for displaying numbers and currency amounts. When you choose it from the CCP Int'l menu, you'll see the two choices:

```
USFormat  InternationalFormat
Use period to separate decimals; comma to separate whole numbers
```

- **USFormat**: To use "." to separate decimal digits from whole digits and "," to separate groups of three whole digits, as in **1,046.00**
- **InternationalFormat**: To use "," to separate decimal digits from whole digits and "." to separate groups of three whole digits, as in **1.046,00**.

After you've selected the default number format you want, you'll again see the Int'l menu. You can go back to the CCP Main menu by selecting **Return**. The default number format you've selected will take effect when you exit from the Custom Configuration Program and restart Paradox.

Remember that you can choose **Image/Format** to change the on-screen number format for individual columns in a table, and then use **Image/Keep-Settings** to save the revised formats (see Chapter 8 for details). In the report generator, you can select **Field/Reformat** from the Report Generator menu to change the format of an individual field (see Chapter 4 of *Presenting Paradox Data*).

Net

```
Video  Reports  Graphs  Defaults  Int'l  Net  PAL  Ascii  Help  DO-IT!  Cancel
Change default network settings.
```

If you run Paradox on a network, or run it from your own computer but access shared tables by connecting to a network, **Net** lets you set your default user name, private directory, and automatic refresh interval. (*Note*: certain network configuration parameters, such as the type of network you're using and the location of the special Paradox control file called PARADOX.NET, can only be changed by a special network reconfiguration program called *nupdate*. See your network administrator for details.)

When you select **Net** from the CCP Main menu, you'll see four choices:

```
UserName  SetPrivate  AutoRefresh  Return
Specify a default user name.
```

- **UserName**: To set or change the default user name that identifies you when other users need resources you have locked
- **SetPrivate**: To set a default or change the default Paradox private directory
- **AutoRefresh**: To set or change the default interval at which you see changes made to tables by other users

- **Return**: To preserve your changes and return to the CCP Main menu.

For more information about these options, see the section on **Tools/Net** in Chapter 10 (Tools).

UserName

UserName SetPrivate AutoRefresh Return
Specify a default user name.

UserName lets you set a default name that identifies you to others who request resources that you have locked. This allows them to request access to the resources they need directly from you.

On networks that support user names, Paradox uses the network operating system to identify each user, so it's not necessary for you to enter a user name explicitly. However, if your network doesn't support user names, or if you'd like to change the one read from the network, you can use the CCP **UserName** selection to designate a default user name that will be set each time you start Paradox.

A name you enter through the CCP will override any user name read from the network. You can also use the **Tools/Net/UserName** selection to change your user name for a single Paradox session.

When you select **UserName** from the CCP Network menu, Paradox will ask what name you want to use as a default. Your current default user name (if any) will already be filled in.

User Name:
Enter user name.

Type a name of up to 15 characters and then press [Enter]. You can use any name that identifies you to other users on the network; it need not be your network login name.

After you've entered the default user name you want, press [Enter] to select it and return to the Network menu. You can go back to the CCP Main menu by selecting **Return**. Your new default user name will take effect when you exit from the Custom Configuration Program and restart Paradox.

SetPrivate

UserName SetPrivate AutoRefresh Return
Enter or change the location of your private directory.

Each Paradox user on a network must have a **private directory**. Among other uses, Paradox uses the private directory to store temporary tables, such as *answer* and *keyviol*. This prevents another user's temporary objects from overwriting your own. When you use Paradox it will appear as though these objects are in your current working directory. Most of the time you will not even be aware that your private directory is being used. See Chapter 2 (Fundamentals) and Chapter 10 (Tools) for details on private directories.

You can use the CCP **SetPrivate** selection to designate or change the default private directory that will be set each time you start Paradox. However, in most network installations, the network administrator is responsible for establishing each user's private Paradox directory through the CCP. This is so because if you designate a shared directory as your private directory, you could be preventing other users from accessing data they've stored there. For this reason, if there is already a default private directory set for you in the CCP, do not change it without first consulting with your network administrator.

If your computer or network workstation has a local hard disk, your private directory should be located there. It's common to use either the root directory or the *\paradox3* directory on a local hard disk as your Paradox private directory. If your workstation does not have a local hard disk, your user or home directory on the network fileserver should be designated as your Paradox private directory.

When you select **SetPrivate** from the CCP Network menu, Paradox will ask which directory you want to designate as the default. The current default (if any) will already be filled in.

Path:
Enter the full path to your private directory, including drive name.

Edit the path to indicate the location of your private directory; then press [Enter]. Remember to use the full path name, including the drive.

After you've selected a default private directory, you'll return to the CCP Network menu. To go back to the CCP Main menu, select **Return**. The default private directory you've designated will take effect when you exit from the Custom Configuration Program and restart Paradox. Note that you will not be able to declare a directory private if someone else has already done so, or if other network users are currently using tables, scripts, or other objects located there.

AutoRefresh

UserName SetPrivate AutoRefresh Return
Set the default automatic refresh interval.

When you share a table with other users, you can see the changes they make to it when Paradox **refreshes** (updates) your screen; see Chapter 2 (Fundamentals) and Chapter 10 (Tools) for details. When an **autorefresh** interval is set, Paradox will look at regular intervals to see if other users have made changes to tables you are using. If they have, your screen will automatically be updated.

When you select **AutoRefresh** from the CCP Network menu, Paradox will ask how frequently you want it to refresh the screen, in seconds. The current default (if any) will already be filled in:

```
Interval: 3
Enter autorefresh interval in seconds or leave blank to disable.
```

The preset default interval is 3 seconds. You can enter any interval between 1 and 3600 seconds (one hour), or leave the interval blank to disable the automatic refresh feature.

After you've selected a default autorefresh interval, you'll return to the CCP Network menu. To go back to the CCP Main menu, select **Return**. The default autorefresh interval will take effect when you exit from the Custom Configuration Program and restart Paradox. You can choose **Tools/Net/AutoRefresh** from the Main menu or **Autorefresh** from the Coedit menu to change your autorefresh interval at any time, overriding the default during the current session.

PAL

```
Video Reports Graphs Defaults Int'l Net PAL Ascii Help DO-IT! Cancel
Specify if indexes are to be incrementally maintained, link in your editor.
```

PAL lets you do two things:

- **specify** the way secondary indexes are to be maintained
- **link** an external editor into the Paradox environment.

The first option can enhance the performance of your applications, the second can help you write them.

When you select **PAL** from the CCP Main menu, you'll see a submenu with three options:

```
MaintainIndexes Editor Return
Choose whether to incrementally update secondary indexes.
```

- **MaintainIndexes**: To choose whether to maintain secondary indexes incrementally or as a whole
- **Editor**: To link an external editor into the Paradox environment
- **Return**: To preserve your changes and return to the CCP Defaults Menu.

MaintainIndexes

```
MaintainIndexes Editor Return
Choose whether to incrementally update secondary indexes.
```

MaintainIndexes lets you choose whether secondary indexes (**QuerySpeedup** files) on keyed tables are maintained incrementally or are updated in batch mode. This can affect the performance of queries and other operations that locate values in tables. See "How Indexes Are Maintained" later in this chapter for details.

When you choose **MaintainIndexes** from the CCP PAL menu, your options will appear on a submenu:

```
No Yes
Disable incremental maintenance of secondary indexes for keyed tables.
```

- **No**: To maintain secondary indexes only when they are out-of-date and are about to be used
- **Yes**: To maintain secondary indexes incrementally, after each set of changes to the table (preset default value).

After you've selected an indexing option, you'll return to the CCP PAL menu. You can select **Return** to go back to the CCP Main menu. Your indexing choice will take effect when you exit from the Custom Configuration Program and restart Paradox. Remember, it will apply only to secondary indexes created on keyed tables after that time; existing indexes will continue to be maintained as when they were created.

You can also create secondary indexes that are maintained by using the PAL INDEX command with the MAINTAINED option. This option is not dependent on the CCP **MaintainIndexes** option.

Editor

```
MaintainIndexes Editor Return
Link your own editor into the Paradox environment.
```

Editor lets you link your own Ascii text editor or word processor into the Paradox environment in place of the built-in Script Editor. If you specify an external editor, it will be automatically accessed in place of the built-in editor in every context that the built-in editor would normally be called, including when you select **Scripts/Editor** from the Paradox Main menu and when you select **Editor** or press Editor [Ctrl][E] in a PAL debugging session.

The advantages and disadvantages of using an external script editor are discussed in the section on "Editors" in Chapter 9 (Creating and Playing Scripts) of the *PAL User's Guide.*

When you link in an editor, you can specify

- The name of the editor
- How much memory will be available to it
- Whether you want Paradox to pass it the name of the current script
- Whether you want Paradox to pass it the number of the current script line

When you select **Editor** from the CCP PAL menu, Paradox will ask what DOS command to execute to run your editor:

```
Editor Command:
Enter the command line to call your editor.
```

Type the DOS command that starts your editor and any additional parameters, as described below. Paradox will be suspended and this command executed when you select **Editor** from the Scripts or Debug menu or press Editor [Ctrl][E] in the Debugger.

If your editor can accept a text filename from the DOS command line, use an asterisk (*) to represent it in the command you type. When the editor is called, Paradox will replace the * with the name of the script you've requested or (in the Debugger) the one that's currently being debugged.

Similarly, if your editor can accept a line number from the DOS command line, or if you can write a macro to accept this parameter, use a double asterisk (**) to represent it in the command you type. When the editor is called from the Debugger, Paradox will replace the ** with the current line number in the script being debugged.

Normally, when your editor is called, it will have the amount of RAM that would be available if you were to suspend Paradox using **ToDOS** or DOS [Ctrl][O]. You can increase the amount of RAM resources available to the editor by prefixing the command you enter with an exclamation point !. If you use this option, the amount of memory available will be equivalent to that obtained by using DOS Big [Alt][O].

Suppose you want to link your editor into Paradox and you call it with the DOS command WS. You would enter the following command:

Editor Command:WS *

If you wanted the maximum amount of memory to be available and also wanted to make the number of the current script line available to the editor, you would enter:

Editor Command:**!WS * ****

After you've entered the editor command you want, press [Enter] to select it and return to the CCP PAL menu. You can select **Return** to go back to the Main menu. Your editor will be available when you exit from the Custom Configuration Program and restart Paradox.

Note that when you link in your own editor, the built-in Script Editor is not available. To access the built-in editor, you must play *custom* once again to remove the command line that accesses your external editor.

Since scripts are straight Ascii text, your editor or word processor must be in non-document mode or its equivalent. Special control characters or formatting symbols inserted into a script will cause the text to be misinterpreted and will almost certainly result in script errors.

When you are using your own editor during a Paradox session, remember that Paradox is suspended. Refer to the discussion of **ToDOS** in Chapter 10 (Tools) for precautions you should take while Paradox is in this state. In particular, it is dangerous to suspend your editor to run other programs while Paradox is suspended. Also, always remember to exit your editor and return to Paradox rather than completing an editing session and turning off your computer. If you don't return to Paradox and then exit back to DOS in the usual way, you risk losing data.

Ascii

```
Video  Reports  Graphs  Defaults  Int'l  Net  PAL  Ascii  Help  DO-IT!  Cancel
Change ASCII import and export defaults.
```

Ascii lets you change the default **delimiter** and **separator** when using **ExportImport** to convert data between Paradox and Ascii formats. You can also specify how blank values should be exported.

Delimiters and separators are used to distinguish fields in an Ascii file. Consider this Ascii record:

"Smith","George","J","123 Alhambra","Allenville","CA",94307

Each of the seven fields in this record is **separated** from the next by a comma. In addition, each non-numeric field is enclosed or **delimited** by double quotation marks.

Different programs use different rules about how Ascii fields are separated and delimited. With **Ascii** you can configure Paradox to read and write any delimited Ascii file.

When you select **Ascii** from the CCP menu, you'll see a submenu with five choices:

```
Delimiters  Separator  ZeroFill  ChooseDecimal  Return
Change default delimiter or choose fields to be delimited.
```

- **Delimiters**: To change the default delimiter character and choose which fields should be delimited
- **Separator**: To change the default separator character (preset default is a comma)
- **ZeroFill**: To choose whether blank numeric fields should be exported as blanks or zeros (preset default is blanks)
- **ChooseDecimal**: To specify the character to use as the decimal separator when importing Ascii data
- **Return**: To finish modifying the default Ascii conversion settings and return to the CCP Main menu.

Delimiters

```
Delimiters  Separator  ZeroFill  ChooseDecimal  Return
Change default delimiter or choose fields to be delimited.
```

Delimiters lets you choose the default delimiter character and lets you decide which fields should be delimited. When you select it from the Ascii menu, you'll see two choices:

```
Choice  Always?
Choose default delimiter for ASCII files.
```

- **Choice**: To choose the default delimiter character (preset default is ")
- **Always**?: To decide whether all fields, or only non-numeric ones, should be delimited (preset default is non-numeric)

Choice lets you choose the default **delimiter**, which is the character that surrounds delimited fields in Ascii files. When you select **Choice** from the Delimiters menu, Paradox will ask what the delimiter should be:

```
Delimiter: "
Enter the delimiter to use
```

The preset default delimiter (which is already filled in) is a double quotation mark ("). When you **import** an Ascii file, however, Paradox will recognize either a single or double quotation mark (' or ") as the delimiter by default. If the delimiter is any other character, you must make that character the default.

- **Note:** *The delimiter cannot be a space or left blank.*

After you've entered the default delimiter you want, press [Enter] to select it and return to the Ascii menu. Your selection will take effect when you exit from the Custom Configuration Program and restart Paradox.

Always? lets you control which fields are enclosed by the delimiter character. When you select it from the Delimiters menu, Paradox will ask which fields should be delimited:

```
AllFields  OnlyStrings
Delimiters around all fields.
```

- **AllFields**: To enclose all fields by the delimiter
- **OnlyStrings**: To enclose only string (non-numeric) values by the delimiter (preset default value)

The preset default value is **OnlyStrings**, which means that only non-numeric values will be delimited. However, the **AllFields** convention is used by some word processors and form letter programs.

After you select the option you want, you'll return to the Ascii menu. To go back to the CCP Main menu, select **Return**. Your choice of delimiter will take effect when you exit from the Custom Configuration Program and restart Paradox.

Separator

```
Delimiters  Separator  ZeroFill  ChooseDecimal  Return
Choose default separator for ASCII import and export files.
```

Separator lets you choose the default **separator**, which is the character that separates fields in Ascii files. When you select **Separator** from the Ascii menu, Paradox will ask what the separator should be:

```
Separator: ,
Enter the separator to use (may not be a space)
```

The preset default separator (which is already filled in) is a comma (,). You can choose any character as a separator (but not a blank space).

After you've entered the default separator you want, press [Enter] to select it and return to the Ascii menu. To go back to the CCP Main menu, select **Return**. Your choice of separator will take effect when you exit from the Custom Configuration Program and restart Paradox.

ZeroFill

```
Delimiters  Separator  ZeroFill  ChooseDecimal  Return
Choose default for empty fields in ASCII export files (zero or null).
```

ZeroFill lets you control how blank numeric fields are exported. When you select it from the Ascii menu, you'll see two options:

```
Nothing  Zeros
No character between separators to represent empty fields.
```

- **Nothing**: To export blank numeric fields as blanks (preset default value)
- **Zeros**: To convert blank numeric fields to 0 on export

The preset default value is **Nothing**, which means that blank numeric fields will remain blank. You can select **Zeros** if the receiving program requires a 0 value.

After you select the option you want, you'll return to the Ascii menu. To go back to the CCP Main menu, select **Return**. The **ZeroFill** option you've chosen will take effect when you exit from the Custom Configuration Program and restart Paradox.

ChooseDecimal

Delimiters Separator ZeroFill ChooseDecimal Return
Change the default decimal separator.

You can import or export numeric and currency data that is formatted with the International convention for separating decimal and whole numbers. If you are importing data from programs such as Quattro, Reflex, 1-2-3, Symphony, and dBase, Paradox will automatically import and export numbers and currency correctly no matter which convention you choose.

However, when you export or import numeric data from an Ascii, pfs, or IBM Filing Assistant file that is formatted using a non-U.S. convention (e.g., the number 1.234,56), it is necessary to tell Paradox the character that will represent the decimal separator.

To enable you to do this, select **ChooseDecimal**. You will see a submenu with two choices:

Period Comma
Set the decimal point to the period (.) for Ascii import and export.

- **Period**: To use the period for the decimal point (preset default)
- **Comma**: To use the comma for the decimal point

To change the decimal point character, move the highlight to the option you want and press Enter to return to the Ascii menu. To go back to the CCP More menu, select **Return**. When you exit the CCP, your new default selection will take effect.

Note that since the "," is often used as a field separator, if you are importing delimited numeric data that uses the "," as the decimal separator and the field separator, there could be a conflict between the decimal separator and the field separator. To prevent this potential ambiguity, you should make sure that all the fields in the file you are importing are delimited.

You can make certain that there is no ambiguity when you are exporting Paradox data to other systems by choosing the **Delimiters/Always?/AllFields** option from the Ascii menu.

Command Line Configuration

If you want to choose video options without changing the defaults, you can tell Paradox about your monitor and adapter on the DOS command line when you start the program. This may be useful if you're temporarily using a different monitor or if you have two different monitors. These settings remain in effect only for the current Paradox session. You can also use command line configuration to control the amount of expanded memory used by Paradox.

To specify your monitor on the DOS command line, follow the program name **paradox3** with one or more of the following options:

- **-mono** to tell Paradox you're using a monochrome monitor with a monochrome adapter
- **-b&w** to tell Paradox you're using a monochrome or black-and-white monitor with a color/graphics (CGA) or enhanced graphics adapter (EGA)
- **-color** to tell Paradox you're using a color or enhanced color monitor with a color/graphics or enhanced graphics adapter
- **-snow** to eliminate interference ("snow") when using an IBM Color/Graphics Adapter.

You may combine *-snow* with another option if you wish. For example, to run Paradox on a black-and-white monitor connected to a color graphics card, type **C> paradox3 -b&w**. To run Paradox on a color monitor connected to an IBM Color/Graphics Adapter, type **C> paradox3 -color -snow.** For more information about these options, see "Video" earlier in this section.

Allocating Expanded Memory

By default, Paradox makes use of all the expanded memory available; this results in the greatest possible improvements in performance and capacity. However, you can reserve expanded memory for other purposes. This is useful when you are running Paradox in an operating environment where two or more programs can concurrently take advantage of expanded memory. For example, if you are running Paradox under DesqView, you will probably want to restrict the total amount of expanded memory available to Paradox.

To do this use the **-emK** option when you start Paradox. To specify how much of the expanded memory, in K, you want Paradox to use, follow the **-emK** option with the amount of memory in K. For example, to allocate 1 megabyte of EMS to Paradox, type **C>paradox -emK 1000**. Be sure to leave a blank between the emK option and the amount of K you are allocating. To disable the use of expanded memory altogether, type **C>paradox -emK 0**.

Displaying Many-to-Many Databases

The section on "Many-to-Many Links" in Chapter 2 (Designing Forms) of *Presenting Paradox Data* raised the issue of showing many-to-many relationships on multitable forms. When your data are stored in standard, normalized tables, you can display such relationships in a limited way.

In normal form, each table contains information about one kind of object (a product, a vendor, a customer, an order). Since a many-to-many link contains two kinds of objects, you would typically store data about them in two normalized tables. A third table would store the relationships or linkages between the two object tables. (For a brief discussion of normalization, see "Tips on Creating Tables" in Chapter 6 of this manual.)

Because you can't have multiple levels of linked tables, if you need to show more aspects of the many-to-many relationship, you can restructure your tables in a denormalized way. This introduces redundancy into your database, which is generally undesirable but in this case lets you see more information at one time.

14-1. Many-to-Many Relationships with Normalized Tables

Suppose some products offered by the Luxury Gifts department are supplied by several vendors, and some vendors supply several products. The figures show how you might store this information in normalized tables, and how you might display it in a many-to-many multitable form.

For each order, this form shows possible suppliers for the product. It displays the one-to-many aspect of the relationship between products and suppliers, but other aspects are hidden.

PRODUCTS	Stock #	Description	Quant	Price
1	632	Portable suntan machine	350	12,000.95
2	130	Stretch VW Beetle	3	38,495.95
3	235	Diamond-filled bathtub	1	1,499,000.95
4	244	Mink handkerchiefs (13)	14	12,995.95
5	422	Platinum snuff box	88	124,995.95
6	519	Robot-valet	50	149,995.95
7	558	Digital grandfather clock	266	4,995.95
8	890	Matching panthers/leashes	3	385,000.95
9	983	Gourmet Kenya film safari		50,000.95
10	209	Gucci exec workstation	19	449,999.95

"Linkage" table shows relationships between other tables

SOURCES	Stock #	Vendor
1	244	Acme Indulgences, Ltd.
2	244	Bella's Baubles, Inc.
3	422	Acme Indulgences, Ltd.
4	422	Bella's Baubles, Inc.
5	422	Spotlight Gifts Corp.
6	519	Acme Indulgences, Ltd.
7	519	Practical Luxuries, Inc.
8	558	Practical Luxuries, Inc.
9	558	Spotlight Gifts Corp.
10	632	Acme Indulgences, Ltd.
11	632	Practical Luxuries, Inc.

Some vendors supply several products

Tables linked on Stock # on many-to-many basis

Some products are supplied by several vendors

SUPPLIER	Vendor ID	Name	City	Terms
1	329	Acme Indulgences, Ltd.	Akron	Net 30
2	390	Spotlight Gifts Corp.	Pasadena	2% Net 10
3	450	Bella's Baubles, Inc.	Charleston	Net 10
4	945	Practical Luxuries, Inc.	Lincoln	Net 30

Orders is the master table

ORDERS BY VENDOR 12/16/90

Order #: 3351
Customer #: 3266
Product: 519
Quantity: 1

Only vendors for current product are shown

Supplied by: Acme Indulgences, Ltd.
Practical Luxuries, Inc.

Sources is the detail table

Sold by: 422

Displaying More Detail Information

To display more information about either kind of object, you need to "fold" data from its table into the linkage table.

The redundancy in denormalized tables can make them difficult to maintain. To ameliorate this problem you may want to define a validity check for sources that looks up and fills in the redundant information from the supplier table. This assures that no discrepancies are inadvertently introduced into the data. See "Validity Checks" in Chapter 7 (Modify) for details.

14-2. Displaying More Detail Information

Suppose you want to show more information about suppliers than just their names. The information is in the *supplier* table, but you can't include it on the form because it contains no link to *orders*, the master table, and you can't link one detail table to another.

Instead, you can restructure *sources*, the detail table, to include information from *supplier*. This information is redundant because it's repeated for each product a vendor supplies.

Information from *supplier* is repeated for each product

SOURCES	Stock #	Vendor	Vendor ID	City	Terms
1	244	Acme Indulgences, Ltd.	329	Akron	Net 30
2	244	Bella's Baubles, Inc.	450	Charleston	Net 10
3	422	Acme Indulgences, Ltd.	329	Akron	Net 30
4	422	Bella's Baubles, Inc.	450	Charleston	Net 10
5	422	Spotlight Gifts Corp.	390	Pasadena	2% Net 10
6	519	Acme Indulgences, Ltd.	329	Akron	Net 30
7	519	Practical Luxuries, Inc.	945	Lincoln	Net 30
8	558	Practical Luxuries, Inc.	945	Lincoln	Net 30
9	558	Spotlight Gifts Corp.	390	Pasadena	2% Net 10
10	632	Acme Indulgences, Ltd.	329	Akron	Net 30
11	632	Practical Luxuries, Inc.	945	Lincoln	Net 30

```
                    ORDERS BY VENDOR          12/16/90

                  Order #:        3351
                Customer #:        3266
                   Product:         519
                  Quantity:           1

Supplied by:

Vendor ID        Vendor Name                City          Terms
---------  ------------------------  ---------------  ----------
  329      Acme Indulgences, Ltd.    Akron            Net 30
  945      Practical Luxuries, Inc.  Lincoln          Net 30


                                      Sold by:        422
```

Multitable form shows detailed supplier information

Displaying the Reverse Relationship

A multitable form can show only one side of a many-to-many relationship. You'll need a second form to show the other side. You'll also need to rearrange the key fields in the detail (linkage) table so that it links properly to the object table. It is usually most convenient to create a new detail table to do this, rather than restructuring the original.

The two detail tables—in this case, *sources* and *catalog*—contain redundant information. To prevent them from getting out of synch, you may want to develop scripts that load data from one to the other. After editing either of the tables, play the script that synchronizes the other one.

Paradox Graphics

The memory locations used by Paradox graphics depend on the graphics/color card in your system. To use Paradox graphics with EMS or EEMS, you'll need to modify the REMM.SYS statement in your CONFIG.SYS file to keep the appropriate address free. Here is a list of different graphics adaptors and the corresponding address you'll need to exclude.

Adapter	Address to Exclude
EGA/VGA	A000-AFFF
CGA	B800-BFFF
Hercules	B000-BFFF
MCG	AA000-AFFF
AT&T	B800BFFF
3270	B800-BFFF
T1000	B800-BFFF

For example, AST Rampage users would use the following statement to exclude the memory addresses needed by CGA:

DEVICE = REMM.SYS/X=B800-BFFF

If you need to exclude more than one set of addresses (such as B800-BFFF and CC00-CFFF, to avoid both hardware and graphics conflicts) the statement would look like this:

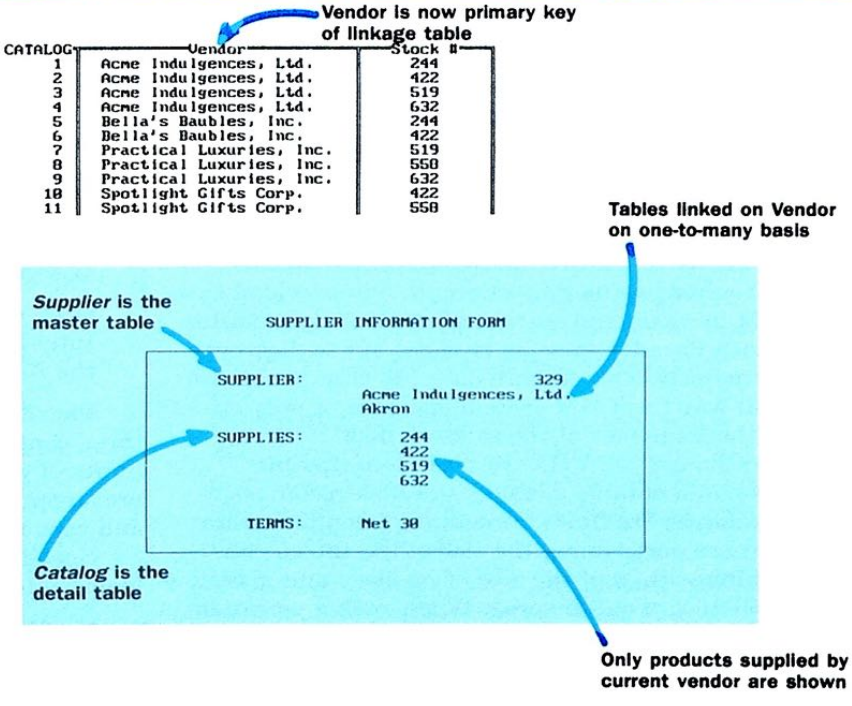
DEVICE = REMM.SYS/X=B800-BFFF,CCOO-CFFF

14-3. Showing the Reverse Relationship

The forms in the last two examples showed which vendors supply each product. Now suppose you want to show which products are supplied by each vendor.

The information is in the *supplier* and *sources* tables, but you can't link *sources* to a master supplier form because its first field, Stock #, doesn't match a field in *supplier*. Instead, you'll need to construct a new table called *catalog* that displays source information arranged by supplier.

If you want to show more information about each product, you can include other fields from *products* in *catalog*, as illustrated in Example 14-2.



CATALOG	Vendor	Stock #
1	Acme Indulgences, Ltd.	244
2	Acme Indulgences, Ltd.	422
3	Acme Indulgences, Ltd.	519
4	Acme Indulgences, Ltd.	632
5	Bella's Baubles, Inc.	244
6	Bella's Baubles, Inc.	422
7	Practical Luxuries, Inc.	519
8	Practical Luxuries, Inc.	550
9	Practical Luxuries, Inc.	632
10	Spotlight Gifts Corp.	422
11	Spotlight Gifts Corp.	550

How Paradox Manages Memory

Paradox has a sophisticated **virtual memory management system** (VMM) that automatically manages available memory and disk space to optimize performance. In essence, the VMM system uses space on your working disk drive to extend available RAM resources memory, and thus makes your computer think it has more memory than it actually does. This lets you work with tables and scripts that are much larger than available memory but still obtain RAM-like performance. The VMM system allows you to obtain even faster performance if you have expanded memory available.

The VMM system automatically handles allocation of memory for

- data stored in tables
- text of scripts
- PAL memory variables and arrays
- swapping PAL procedures into and out of RAM

Beacause the VMM system encompasses both RAM and disk resources, it is not necessary for you to worry about, or even be aware of, when files are opened, closed, or saved. This is true whether you are using Paradox interactively or to run a PAL application. Paradox automatically takes care of moving data between RAM and the disk and ensures that any changes you make to tables, scripts, and other objects are properly recorded and saved. So long as you exit Paradox by selecting **Exit** from the Main menu and there are no power failures or similar unexpected events, all of your Paradox data are protected.

The autosave feature (discussed earlier in this chapter) enhances the protection already provided by the VMM by taking advantage of pauses in your interaction with Paradox to write changes out to disk even more frequently. This feature does not change the fundamental way the VMM system operates, it only optimizes the frequency of the saves to disk.

Even though the VMM system optimizes the utilization of available memory and disk resources, these resources are finite. Depending upon the operations you are performing, the size of the tables you are working with, and the size of memory and disk, it is possible to run out of space. When such a situation occurs, Paradox will protect you from losing data; however, you may not be able to complete the current operation without first providing additional disk or memory resources.

The rest of this section discusses

- the memory and disk space you need to run Paradox
- using expanded memory to further enhance performance.

Memory and Disk Requirements

Paradox needs at least 512K bytes of random access memory (RAM) to run on your computer. Since RAM access is much faster than disk access, the more memory that's available, the better Paradox will perform. Note that RAM-resident programs will reduce the memory available to Paradox and thus affect performance.

Paradox also needs enough disk space to store and manipulate files during query processing, sorting, and other operations. A good rule of thumb (especially for hard disk systems) is that the available space on your disk should be at least twice the size of your largest Paradox table (.DB file). For example, if your largest table is 1 megabyte, you should have 2 megabytes or more of free space available. Although this is not an absolute requirement, it will help to ensure good performance.

Expanded Memory

Although DOS cannot currently work with more than 640K bytes of RAM, two kinds of **expanded memory** boards provide additional memory that can be used to increase Paradox's performance.

- The **Expanded Memory Specification**, or EMS, is also called the Lotus-Intel-Microsoft (LIM) specification. It includes memory boards like the Intel AboveBoard. Paradox supports both LIM 3 and the newer LIM 4.0 specifications.
- The **Enhanced Expanded Memory Specification**, or EEMS, is an enhancement of the Lotus-Intel-Microsoft specification used in boards like the AST Rampage board.

Paradox can use expanded memory in either of these configurations to break through the resource limits of your system and make **extraordinary** improvements in both performance (processing speed) and capacity (table and procedure size).

Specifically, Paradox can devote expanded memory to three areas:

- the **Virtual Memory Manager**. Allocating additional memory to the VMM provides dramatic improvements in performance by effectively extending RAM beyond the DOS 640K barrier.
- a **temporary storage area** which is used to hold

- Paradox overlays (system files) most recently read from disk
- PAL procedures most recently read from libraries
- the suspended state of Paradox (created when you press DOS Big [Alt][O], use the DOSBIG or RUN BIG commands, or access an external text editor you've linked into Paradox), which would otherwise be stored on disk.

When Paradox needs any of this information, it will be retrieved more quickly from the expanded memory temporary storage area than it otherwise could from the disk. When new information is placed in the temporary storage area, it replaces the information (of any kind) that has least recently been used. This ensures that the temporary storage area always contains the most recently used information.

- a **disk cache** which is used to hold information, especially data stored in tables, most recently accessed from or written to disk. If Paradox needs the information again, it can retrieve it quickly from the cache rather than more slowly from the disk. (Note that all writes to disk are always made, even though the data being written are also stored in the cache; thus, even if there is a power failure, there is no danger of losing data that was trapped by the cache and not written to disk).

  Disk caching works only with standard local hard disks on drives C or D. It does not operate with network file servers, hard disks that hold more than 32M bytes, Bernoulli-type disks, or tape backup systems.
  Note that, when you use **Tools/More/ToDOS**, DOS [Ctrl][O], or DOS Big [Alt][O] to suspend Paradox, the cache is cleared and turned off to avoid interfering with other programs. Since all the information in the cache is also stored on disk, no data will be lost.

How Expanded Memory is Allocated

If you have expanded memory, Paradox takes advantage of it automatically. Normally, Paradox takes all the expanded memory available (up to 8 megabytes) and allocates it as follows:

1. First, it allocates as much memory as possible to the Virtual Memory Manager. The maximum allocation is 48K for the EMS specification or 208K for the EEMS specification. The full EEMS allocation more than doubles the memory available to the VMM and thus produces the most dramatic performance improvements.
2. If more expanded memory is available, Paradox allocates up to 192K to the temporary storage area.
3. If still more expanded memory is available, Paradox allocates 75% of it to the disk cache and the remaining 25% to temporary storage.

The initial allocation of expanded memory to the VMM is fixed. However, you can use the **Defaults/EMS** selection of the Custom Configuration Program to change the way the remaining memory is allocated between the cache and temporary storage. You can also use the command line to limit the total expanded memory taken by Paradox.

For details on these options, see **Defaults/EMS** and "Command Line Configuration" in the description of the CCP earlier in this chapter.

Special Note for Rampage Users

Certain hardware devices may conflict with Paradox's use of expanded memory on the AST Rampage board. These include

- a composite color monitor
- a color/graphics adapter card
- an enhanced graphics adapter card
- an IBM Token Ring network card.

You'll know you have a conflicting device if Paradox fails to start and displays a message like **Memory conflict at....** If this happens, you need to modify the REMM.SYS statement in your CONFIG.SYS file by adding a statement that excludes certain memory addresses from the EEMS allocation.

- If you have an IBM Token Ring card, your REMM.SYS statement should look like **either**

  DEVICE = REMM.SYS /X=CC00-CFFF
  or
  DEVICE = REMM.SYS /X=DC00-DFFF
  You'll need to refer to your Token Ring card documentation to determine the addresses being used by your card in order to find out which device statement to use.

- If you don't have an IBM Token Ring card, but have a color or EGA adapter card, your REMM.SYS statement should look like this:

  DEVICE = REMM.SYS /X=B800-BFFF

Indexing Tables

An **index** on a table is like an index to a book; it helps you locate information quickly.

You can think of an unindexed table as a telephone directory in which the names appear in random order. To find a particular telephone number, you would have to scan through each page, starting from the beginning, until you found the listing you were looking for. As you might imagine, such a search could take a long time, especially if the book were large and the name you were looking for happened to be near the end. In technical terms, this method of finding records is called a **sequential search**. This is what Paradox has to do to locate records in an unindexed table.

To help Paradox locate records more quickly, you can **index** your tables. There are two kinds of indexes you can create:

- primary indexes
- secondary indexes.

Once indexes on a table are set up, Paradox maintains and uses them automatically. You never have to update or regenerate an index or remind Paradox to use it.

Primary indexes. These are created when you designate **key fields** for a table. The index lists the records in key-field order. In addition, Paradox keeps the table sorted in this order and prevents records with duplicate key fields.

A standard telephone book, with the names in alphabetical order, is similar to a table keyed on last and first name. Because the records are ordered alphabetically in most telephone books, it's easy and quick to look up a number by first locating the section of the book containing the name you're looking for and then searching for the name you want within that section. Similarly, it's easy for Paradox to locate a record with a particular key value in a keyed table.

By definition, you can only have one primary index on a table (because there's only one set of key fields, and Paradox can't keep the table sorted in two ways at once).

For details on creating primary indexes, see "Key Fields" in Chapter 6 (Create).

Primary indexes depend on the sort order you have installed. If you change the sort order, you must delete and regenerate all primary indexes on your tables. For details, see "Sort Orders" later in this chapter.

Secondary indexes. These may be created when you select **Tools/QuerySpeedup** and a query is on the workspace, or when you use the PAL INDEX command. In addition, Paradox sometimes automatically creates a secondary index during query processing. Each index lists the records in order of the values in the non-key field.

Suppose you want to see the names of people who live only in a particular city. Neither the random nor the alphabetical telephone book would give you much help in finding the listings in the city you want. But suppose you had another index listing, sorted by city, containing the city, page, and line number of everyone in the phone book. You can see how much more quickly you'd be able to locate the names you want.

Secondary indexes are used in these Paradox operations:

- queries
- the **Image/Zoom/Value** selection
- Zoom [Ctrl][Z] and Zoom Next [Alt][Z]
- the PAL LOCATE command (unlike queries, LOCATE can use a secondary index even with a pattern such as **S..**).

You can have as many secondary indexes on a table as it has fields.

For details on creating secondary indexes, see **QuerySpeedup** in Chapter 10 (Tools), and the INDEX command in Chapter 20 (Command Reference) of the *PAL User's Guide*.

How Indexes are Maintained

Primary indexes are automatically maintained by Paradox so that they are always up-to-date. That is, when you complete a change to a table—by pressing Do-It! [F2] to end an edit or data entry session, for example, or by moving off a changed record in a coedit session—Paradox checks for key violations, re-sorts the table in key field order, and updates the primary index.

Secondary indexes can be maintained in one of two ways:

- in batch
- incrementally.

In batch mode. This means that the index is not updated when you complete a change to a table. Instead, it is marked "out of date" and is completely regenerated the next time it is about to be used.

All secondary indexes on unkeyed tables are maintained in this way, as are indexes on keyed tables created when the CCP **MaintainIndexes/No** option is selected (see the section on **MaintainIndexes** earlier in this chapter).

Incrementally. This means that the index is updated after every completed change to the table.

When an index is incrementally maintained, only the affected portion of the index is changed. Since the index is always up-to-date, queries and other location operations can be substantially faster.

There are three ways to create secondary indexes that are maintained incrementally on keyed tables:

- Paradox sometimes creates a secondary index during query processing when the CCP **MaintainIndexes** option is in effect (this is the preset default)
- you can use the **Tools/QuerySpeedup** option when the CCP **MaintainIndexes** option is in effect
- you can use the PAL INDEX command with the MAINTAINED option.

Incremental maintenance is especially attractive for large tables.

Here is a list of the events that cause a secondary index to be incrementally maintained:

- queries using the *changeto*, *delete*, or *insert* operators
- **Coedit** after each record is posted
- **Edit** after pressing Do-It! [F2]
- **Modify/DataEntry** after pressing Do-It! [F2]
- **Modify/MultiEntry** after pressing Do-It! [F2]
- **Tools/Add** after pressing Do-It! [F2]
- **Tools/MultiAdd** after pressing Do-It! [F2]
- **Tools/Subtract** after pressing Do-It! [F2]
- **Tools/Empty** after pressing Do-It! [F2]
- **Tools/ExportImport/Import/Ascii/Append-Delimited**.

Once a secondary index has been created, Paradox always tries to maintain it in the same way if possible. For example, an index maintained in batch mode will still be maintained in that way if you later turn on the CCP **MaintainIndexes** option. Similarly, if you restructure a table, Paradox restructures its indexes so that they continue to be maintained in the same "flavor". However, if you drop a table's key when you restructure it, all indexes will be maintained in batch mode (because only keyed tables can have incrementally maintained indexes).

Thus, there are two ways to change the maintenance type of an index:

- use the PAL INDEX command to regenerate it and reverse the use of the MAINTAINED keyword; or
- use **Tools/Delete/QuerySpeedup** to delete all secondary indexes on the table, reverse the CCP's **MaintainIndexes** option, and use **Tools/Query-Speedup** to rebuild them.

See the description of the PAL INDEX command in Chapter 20 (Command Reference) of the *PAL User's Guide* for more information on indexes.

Sort Orders

There are many times in Paradox when records are arranged or selected in a certain order. For example,

- keyed tables are maintained in order of their primary keys
- *answer* tables are sorted by their first fields
- records in grouped reports are sorted by the values of the grouping fields
- you can use **Modify/Sort** to sort a table by any number of fields
- queries that use >, <, >=, or <= as selection operators in alphanumeric fields "sort" each field value with respect to the selection criterion.

In these cases, the exact arrangement or selection of records depends on the installed **sort order**. Paradox offers a choice of four different sort orders:

- **Ascii** (American Standard Code for Information Interchange). In Ascii order, capital letters are grouped together before lowercase letters. Accented characters such as é and ü come after all unaccented characters. Only Ascii sort order was available in releases 1.0 and 1.1 of Paradox.

  Although Ascii is the standard computer sorting sequence, it is inappropriate for many international applications:

  - since capital and lowercase letters are grouped separately, names like deFiguerido and d'Angelo do not sort in proper sequence
  - special characters and ligatures such as è, ø, ä, and ç are not sorted in proper alphabetic sequence
  - Ascii capitalization conventions are not appropriate for the special international characters.
- **Intl** (International). In this sort order, capital, lowercase, and special characters are combined into a unified sequence. This means that records are sorted according to their alphabetical position, regardless of case or diacritical marks. Characters representing ligatures are also sorted correctly (that is, ü is sorted as "ue" and ß as "ss").
- **NorDan** (Norwegian/Danish). This order is a modification of the international sequence in which certain special characters used in Norway and Denmark, such as å and Ä are placed at the end of the regular alphabet.
- **SwedFin** (Swedish/Finnish). This sequence is a modification of the international sequence in which certain special characters used in Sweden and Finland are placed at the end of the regular alphabet.

When Paradox is installed, a sort order is automatically selected depending on the country group specified. The country-sort order pairings are shown in "Configuring Paradox" later in this chapter. On a network, a single sort order is selected for the whole network.

The exact sort sequences used are shown in the following tables. The tables show only the alphabetic characters in the sequence and do not include graphics characters and other special symbols.

Ascii Sort Order

Char	Ascii Code	Char	Ascii Code	Char	Ascii Code	Char	Ascii Code
A	65	a	97	Ç	128	Ü	154
B	66	b	98	ü	129	á	160
C	67	c	99	é	130	í	161
D	68	d	100	â	131	ó	162
E	69	e	101	ä	132	ú	163
F	70	f	102	à	133	ñ	164
G	71	g	103	å	134	Ñ	165
H	72	h	104	ç	135	α	224
I	73	i	105	ê	136	ß	225
J	74	j	106	ë	137	Γ	226
K	75	k	107	è	138	π	227
L	76	l	108	ï	139	Σ	228
M	77	m	109	î	140	σ	229
N	78	n	110	ì	141	µ	230
O	79	o	111	Ä	142	Υ	231
P	80	p	112	Å	143	Φ	232
Q	81	q	113	É	144	θ	233
R	82	r	114	æ	145	Ω	234
S	83	s	115	Æ	146	δ	235
T	84	t	116	ô	147	∞	236
U	85	u	117	ö	148	Ø	237
V	86	v	118	ò	149	∈	238
W	87	w	119	û	150	∩	239
X	88	x	120	ù	151	≡	240
Y	89	y	121	ÿ	152		
Z	90	z	122	Ö	153		

International Sort Order

Char	Ascii Code	Char	Ascii Code	Char	Ascii Code	Char	Ascii Code
a	97	h	104	Ö	153	ÿ	152
ä	132	H	72	p	112	Y	89
á	160	i	105	P	80	z	122
à	133	ï	139	q	113	Z	90
â	131	í	161	Q	81	å	134
A	65	ì	141	r	114	Å	143
Ä	142	î	140	R	82	æ	145
b	98	I	73	s	115	Æ	146
B	66	j	106	ß	225	α	224
c	99	J	74	S	83	Γ	226
ç	135	k	107	t	116	π	227
C	67	K	75	T	84	Σ	228
Ç	128	l	108	u	117	σ	229
d	100	L	76	ü	129	µ	230
D	68	m	109	ú	163	Υ	231
e	101	M	77	ù	151	Φ	232
ë	137	n	110	û	150	θ	233
é	130	ñ	164	U	85	Ω	234
è	138	N	78	Ü	154	δ	235
ê	136	Ñ	165	v	118	∞	236
E	69	o	111	V	86	Ø	237
É	144	ö	148	w	119	∈	238
f	102	ó	162	W	87	∩	239
F	70	ò	149	x	120	≡	240
g	103	ô	147	X	88		
G	71	O	79	y	121		

Swedish/Finnish and Norwegian/Danish Sort Order

Char	Ascii Code	Char	Ascii Code	Char	Ascii Code	Char	Ascii Code
a	97	i	105	Q	81	Φ	232
á	160	ï	139	r	114	å	134
à	133	í	161	R	82	Å	143
â	131	ì	141	s	115	ä	132
A	65	î	140	S	83	Ä	142
b	98	I	73	t	116	ö	148
B	66	j	106	T	84	Ö	153
c	99	J	74	u	117	ü	129
ç	135	k	107	ú	163	Ü	154
C	67	K	75	ù	151	α	224
Ç	128	l	108	û	150	ß	225
d	100	L	76	U	85	Γ	226
D	68	m	109	v	118	π	227
e	101	M	77	V	86	Σ	228
ë	137	n	110	w	119	σ	229
é	130	ñ	164	W	87	µ	230
è	138	N	78	x	120	Υ	231
ê	136	Ñ	165	X	88	θ	233
E	69	o	111	y	121	Ω	234
É	144	ó	162	ÿ	152	δ	235
f	102	ò	149	Y	89	∞	236
F	70	ô	147	z	122	∈	238
g	103	O	79	Z	90	∩	239
G	71	p	112	æ	145	≡	240
h	104	P	80	Æ	146		
H	72	q	113	Ø	237		

Changing the Sort Order

On a standalone system, you can change the Paradox sort order if you wish by substituting a new sort order file for the current one. However, you will not want to do this often because two things happen:

- **all primary indexes associated with keyed tables become obsolete**
- many Paradox operations will produce different results, which may affect script compatibility.

The system file containing the current Paradox sort order is always called PARADOX3.SOR. It is copied from one of these four files that contain the available sort orders:

- ASCII.SOR
- INTL.SOR
- NORDAN.SOR
- SWEFIN.SOR

Thus, to change the Paradox sort order on a standalone system use the procedure below. Because changing the sort order on a network could affect many users and applications, **if you want to change the sort order on a network, contact your network administrator.**

To Change the Sort Order

Follow these steps to copy the .SOR file you want to your *\paradox3* directory and give it the name PARADOX3.SOR.

1. Exit from Paradox (or whatever other program you are using) so that you see the DOS system prompt for your hard disk (usually **C>**).

   Note: **do not** change the sort order while you have suspended Paradox using **ToDOS**, DOS [Ctrl][O], DOS Big [Alt][O], or the PAL RUN command.

2. If the *\paradox3* directory is not the DOS current directory, change directories. Type **cd\paradox3** and press [Enter].

   If your Paradox system files are stored in some other directory, substitute its pathname in the *cd* command.

3. Place your Paradox Installation Disk (Installation/Sample Tables Disk if you are using 3.5 inch disks) in drive A.

4. Type **C>copy a:*sortfile*.sor paradox3.sor**

   where *sort.file* is the name of the sort file you want. Then press [Enter].

   For example, if you want to install the international sort order, type **copy a:intl.sor paradox3.sor.**

   In a moment you'll see the DOS prompt again. Your new sort order will take effect the next time you start Paradox.

   But before you do, read and follow the instructions in the next section on "Deleting and Regenerating Primary Indexes."

Deleting and Regenerating Primary Indexes

When you change the Paradox sort order, all primary indexes for your tables become obsolete. If you try to use a keyed table, a message will tell you that the primary index is out of date. Thus, to use your keyed tables after changing the sort order, you must discard all of your Paradox primary index files. You can't use Paradox to do this; you must use DOS.

Primary indexes are contained in files with the .PX extension. To delete one, exit to DOS and type

C>del *tablename*.px

where *tablename* is the name of the keyed table. To delete all of the primary indexes on a floppy disk or in the current directory of a hard disk, type **del *.px.** Note: **do not** delete an index file while you have suspended Paradox using **ToDos**, DOS [Ctrl][O], DOS Big [Alt][O], or the PAL RUN command.

If you want to regenerate the primary index for a table using the new sort order, start Paradox and select **Modify/Restructure** from the Main menu. Indicate the key field or fields by placing asterisks (*) after the field type, and then press Do-It! [F2]. For more information, see "Key Fields" in Chapter 6 (Create) of this book.

Configuring Paradox

This section contains information about configuring your computer system to optimize Paradox's performance. It discusses

- parameters of your CONFIG.SYS file
- putting Paradox on your DOS path
- the *init* script
- country groupings.

Configuration Parameters

To provide sufficient resources for Paradox to operate, you must have a CONFIG.SYS file in your startup (boot) directory that sets these DOS configuration parameters:

FILES = 20
BUFFERS = 20

The Paradox installation procedure (see Chapter 3 of the *Introduction to Paradox*) automatically generates or updates the proper CONFIG.SYS file whether you have a hard or floppy disk system. If your configuration parameters are less than 20 FILES and 20 BUFFERS, Paradox will not run.

Depending on what kind of operation you're doing, setting the parameters **higher** than 20 files and 20 buffers may or may not improve performance. Since increasing the number of files and buffers also increases the amount of RAM taken by DOS, this approach may be counterproductive.

One situation in which it is useful to increase the CONFIG.SYS BUFFERS parameter is when the DOS File Allocation Table (FAT) grows too large to keep in memory. The FAT is used to store file directory information while the BUFFERS parameter determines the amount of memory space set aside for the FAT. When this space is exceeded, a disk access occurs each time a file in the directory is called. Since access to files is approximately 6 times slower in this situation, this can have a large effect on the overall performance of Paradox.

One early symptom that the FAT has grown too large is the time it takes to exit from Paradox. The normal exit time is a few seconds. If the FAT cannot be loaded into memory, this time can increase to 30 seconds or more.

The FAT for a directory grows in size each time the total number of files in the directory increases. Unfortunately, the FAT never shrinks—even when a file is deleted. The only way to reduce the size of a FAT is to remake the directory by copying all files in the directory to a new directory and then deleting the

entire existing directory. If remaking a directory is not a practical solution, increasing the BUFFERS parameter in CONFIG.SYS to BUFFERS = 24 will usually provide a remedy.

As stated above, this solution may have a potentially negative effect as well, namely increasing the memory amount of space occupied by DOS. However, the benefits of reducing disk accesses usually outweigh the cost of reducing the available RAM data space.

Putting Paradox on Your DOS Path

If you have a hard disk system and want to start Paradox from any directory on your disk, use the DOS **path** command to put the \ *paradox3* directory on your DOS path. If Paradox can't find its system files in the current DOS directory, it will look along the path to find them. For more information about DOS paths and the **path** command, see your DOS manual.

Setting the correct path is particularly crucial on a network. For more information, see the *Network Administrator's Guide*.

The *init* Script

When you start Paradox, the program looks for a script called *init* in the same directory as the Paradox system files. Although no *init* script is necessary, if found it is played back as soon as the program is loaded. Commands in *init* take effect before control of Paradox is given to the user. If you're familiar with DOS, you'll recognize that a Paradox *init* script is similar to a DOS AUTOEXEC.BAT file.

You can use the *init* script to automatically perform any operations you do routinely when you start Paradox. For example, the script might change your working directory, view a certain table, or display a list of your tables.

An *init* script can be particularly powerful if it includes PAL programming commands. For example, the script could automatically set up keyboard macros or display a menu of your most frequent Paradox operations. Selecting an item from the menu would play another script designated in the *init* program.

Country Groups

When you install Paradox, you have a choice of five country groups. Your choice affects the default date and number formats, sort order, and **DisableBreak** setting as shown in Table 14-2.

Table 14-2. Effects of Country Groups

Country group	Date format	Number format	Sort order	DisableBreak setting
U.S.	mm/dd/yy	U.S. (1,234.56)	Ascii	enable
English Int'l	dd.mm.yy	U.S. (1,234.56)	Intl	enable
European	dd.mm.y	Intl (1.234,56)	Intl	disable
Norwegian/Danish	dd.mm.y	Intl (1.234,56)	NorDan	enable
Swedish/Finnish	dd.mm.y	Intl (1.234,56)	SwedFin	enable

Troubleshooting

If something unexpected happens and you can't figure out how to proceed, press Help [F1]. Paradox will display helpful information about whatever you are doing at the moment. You can display other help screens by choosing from the Help menu or using the help index. If an error message appears, look it up in Appendix A.

If Help [F1] doesn't work and you can't find information about the problem anywhere else in this manual, check this chapter. It contains suggestions about dealing with situations you may find confusing.

If nothing seems to solve the problem, see the section on "Obtaining Technical Support" at the end of this chapter.

1. What If the Cursor Keys Don't Move the Cursor?

You may be at the edge of the table or form, where you can't move further in that direction. Check "The Keyboard" in Chapter 2 of this manual for a description of the cursor keys.

If you hear beeps or numbers appear when you press the cursor keys, or you see the message **Press Edit [F9] or Coedit [Alt][F9] if you want to make changes**, you may have inadvertently pressed [NumLock] to switch the cursor keys to numeric mode. Press [NumLock] again to return the keys to cursor mode; then try the cursor keys again.

2. What If the Program Won't Respond to Your Keystrokes?

If Paradox seems to freeze, it may be carrying out an operation that takes more than a few seconds. Wait a short time and try again.

If Paradox is not executing an operation, you may have accidentally pressed [Shift][PrtSc], which prints the contents of the screen on your printer. You may not be able to proceed until printing is complete (usually just a few seconds). If your printer is turned off, the program will seem to pause briefly and then resume normally.

If you're working in a multiuser environment, a pause or slowdown may mean that there is a lot of activity on the network, which is causing slowness on the network itself.

In addition, you should check the current setting of the Paradox **automatic retry period** to see if that could be the cause of the slowness. The retry period controls the period during which Paradox will automatically keep trying to obtain a locked object. If it is set to more than a few seconds, it could cause performance degradation when you use Paradox interactively. (You can check by press ing PAL Menu [Alt][F10] and typing **retryperiod ()** [Enter].) It is possible that a script or application running on your workstation adjusted the retry period and did not reset it. See the description of the SETRETRYPERIOD command in Chapter 20 (Command Reference) of the *PAL User's Guide* for details.

3. What If a Query Doesn't Give the Result You Expect?

Of the things that can go wrong with queries, perhaps the most frustrating involves spelling and case inconsistencies in tables. For example, you query your *customer* table for someone named *Svenwald*, but the query comes back empty. You know Sven-wald's in the table; in fact, you can **View** the table and find her record! Finally, after a half hour of trying to find out what's wrong with the query, you notice that the name in the table is spelled *Svenvald*, not *Svenwald*.

The *like* operator can relieve this kind of problem because it doesn't require an exact match of the search criterion. For example, querying for names *like Svenwald* would have retrieved Svenvald's record immediately. **If a query doesn't give the result you expect, use *like* to see if the problem might be a simple spelling or case error.**

4. What If You Run Out of Disk Space?

Paradox needs plenty of disk space in your working directory to carry out operations like processing queries, preparing reports, and sorting. The program has an "early warning system" that will warn you if there's not enough disk space to finish an operation. For example, you might see the message **Not enough disk space to sort**.

If you see a message like this, **stop what you're doing**. If you've just begun an operation, cancel it. If you're in the middle of an operation like editing or data entry, don't make any more changes; stop and try to save what you've done already.

Once you've stopped the current operation, try to **free resources** in order to correct the underlying problem:

1. If your working drive is a floppy disk, use **Tools/More/Directory** to change it to your hard disk (if you have one) or to a floppy disk with more free space.
2. Images on the workspace take memory and disk space to manage. Try pressing Clear Image [F8] or Clear All [Alt][F8] to clear the workspace. This will free up memory that Paradox may be able to use instead of disk space. Start the operation again with the additional resources.
3. Tables with many fields or with very large records take a lot of memory and disk space to manage. It's more efficient to have several smaller tables than one large one. If you have large tables, use **Modify/Restructure** to divide the fields among several smaller ones. Note that it's not the **number** of records that's the problem, it's the size (width) of each record.
4. If your hard disk is short of free space, delete or move files from it to make more available. A good (though not absolute) rule of thumb (especially for hard disk systems) is that the available space on your disk should be at least twice the size of your largest Paradox table (.DB file). For example, if your largest table is 1 megabyte, you should have 2 megabytes or more of free space available.
5. If you are working on a network, remember that Paradox temporary tables are stored in your private directory, and not in the current working directory. Therefore, when you are looking for files to delete, make sure to search in your private directory (note that this only makes sense if your private directory is on the same disk as the one on which there is insufficient space).

There are situations in which you can run out of disk space altogether before Paradox has a chance to warn you. For example, suppose you are working on a network and begin to perform a sort. Before starting the operation, Paradox computes that it will need about 300K bytes of disk space to complete the sort and determines that there is currently 500K bytes available. Now suppose that in the middle of the sort operation, another user copies a 350K file from a floppy disk onto the network fileserver. There is now not enough disk space left to complete the sort.

In this case, Paradox will automatically take you to DOS and prompt you to delete some files to free disk space so that it can continue the operation in progress. Paradox will inform you how much disk space it needs to continue with the next phase of the operation. This figure is the **minimum amount** required. If you only provide the minimum amount of space, you may be sent to DOS once again soon after. It is therefore a good idea to free up as much space as possible if you find that you have been sent to DOS. After you have deleted some files, type exit at the DOS prompt to resume the Paradox operation.

When you are at the DOS prompt in the middle of a Paradox operation, it is as if you had suspended Paradox by using **ToDOS,** DOS [Ctrl][O], or DOS Big [Alt][O]. The cautions concerning these operations contained in the description of **ToDOS** in Chapter 10 (Tools) should guide your actions as you delete files while Paradox is suspended. In addition, as you search for files to remove from the disk **do not** delete

- any files containing any currently-active Paradox objects
- any Paradox lock files (those with the extension .LCK)
- any Paradox temporary files (those with the extension .TMP)
- any of the Paradox system files (those with the root name PARADOX or PARADOX3).

After you have deleted some files and type exit, Paradox will try to resume the operation. If you have not deleted enough files to provide the minimum amount of disk space required to continue, Paradox will end the operation and you will see the message **Resource limit exceeded...** and the automatic recovery process outlined in the next section will take over.

5. What If You Exceed a Resource Limit?

Despite its "early warning system," Paradox sometimes may totally run out of a resource like memory or disk space. In this case you will see a message like **Resource limit exceeded: out of memory.**

If this happens, Paradox will try to recover automatically. It will do what it can to free resources—clear the workspace, delete temporary tables, erase keyboard macros and any values set by an *init* script—while keeping your tables and data intact. When you are able to continue, you'll start with a

"clean slate" (your working directory will be maintained, however).

To help prevent the problem from recurring, try these steps to free resources:

1. If your working drive is a floppy disk, change it to a hard disk or to a floppy disk with more free space.
2. Use **Modify/Restructure** to break up large tables with many fields or large records into several smaller ones.
3. Delete or move files from your hard disk to free space.

6. What If an "Unexpected Condition" Occurs?

Sometimes Paradox won't be able to recover from an error. This may happen, for example, when

- the operating environment has been changed or memory resources have been reduced while Paradox was temporarily suspended (through the **ToDOS** selection or DOS [Ctrl][O])
- a floppy disk is removed or the drive door opened in the middle of an operation
- the DOS limit of 112 files on a floppy disk is exceeded
- you don't press Clear All [Alt][F8] before changing a floppy disk in a drive.

Paradox can't continue operating in such cases. You will see a message like **Unexpected condition: disk seek error**.

The program will exit to DOS, leaving the message on the screen. Any changes not saved will be lost. The most you can do in such a situation is to try to make sure the problem doesn't happen again.

In rare cases, Paradox may tell you that a table has been corrupted. Although a corrupted table is unusable, it can usually be recovered—though not with the Paradox program itself. You may either substitute a recent backup or call the Paradox Technical support line at as described in the next section.

Obtaining Technical Support

If you have a question about using Paradox and you are the registered owner, you may contact one of the following sources for technical assistance:

- CompuServe: If you're a member of CompuServe, type **Go Borapp** at any menu prompt to access the Borland Forums.
- BIX: If you're a member of the Byte Information Exchange (BIX), just type **Join Borland**.
- Mail correspondence: Send mail inquiries to:

  Borland, Belmont Center
  Paradox Technical Support
  1301 Shoreway Road, Suite 221
  Belmont, CA 94002-4106

- Phone calls: You can call our Technical Support Hotline between 7:00 am and 4:00 pm (Pacific Time) at (415) 595-4851. Please have the serial number from your master diskette ready to give to the support technician when you call. Support cannot be provided without it. Also have your manual handy and be prepared to provide the following information:
  - computer name and model, and the name and model of any additional hardware (video adapters, modem, etc.)
  - operating system and version number (typing ver at any DOS prompt will get you the version number)
  - the contents of your AUTOEXEC.BAT and CONFIG.SYS files
  - the specific steps that will reproduce the problem you're having.
- If you have a question about a product update or return, or an inquiry about an order placed with Borland, call Customer Service at (408) 438-5300.

Error Messages

...and...have incompatible structures You cannot add the records of one table to another if their structures are incompatible. See Chapter 12 (Tools) for more information on adding.

A desired new value must be provided to Changeto In a Changeto query, you must specify a new value that you want existing values to be changed to.

A field cannot contain more than one expression to be Inserted In an Insert query, you can only have one expression per field. Make sure that only one value is present in each field of the Insert query form. See Chapter 4 (Ask) for more on Insert queries.

A field may contain only one Changeto expression In a Changeto query, each field can contain only a single Changeto expression. If you want to do multiple Changetos in a field, you must do so in two or more separate steps. See Chapter 4 (Ask) for more on Changeto queries.

A set operation cannot be included in its own grouping When you use the set keyword in a query, you must both define the set and then specify a set condition operator (such as only, every, or exactly) that uses the set. These two components—the set definition and the expression that uses the set—can't be on the same line of the query statement. See Chapter 4 (Ask) for details.

A value must be provided in this field The field has been designated as "required" by establishing a validity check. You must post a value to this field during an editing or a data entry session. See Chapter 9 (Modify) for information on validity checks.

Access denied... You will see messages beginning with "Access denied" if you are working on a network and are trying to access an object or directory that you do not have sufficient rights to use. Typically, the problem is not at the Paradox level, but at the network level. For example, you'll get this type of message if you try to make a read-only directory your working directory. See your network administrator if you cannot determine the cause of this problem.

All fields have been placed In forms design, each regular field can only be placed once per form. See Chapter 11 (Forms) for more on forms.

All fields in a multirecord form must be in the area to be duplicated When you're designing a multirecord form, all of the fields you place on the form must be included in the area that will serve as the model for the duplicated records. Make sure that every field on the form—including the date and record number fields—are placed within this area when you are defining the area to be duplicated. See Chapter 2 of *Presenting Paradox Data* for details.

All tables on the workspace are write-protected You cannot edit any of the tables currently on the workspace, because they are all write-protected.

Ambiguous use of ! (inclusion operator) When you use the inclusion operator multiple times in the same query, or when you use the inclusion operator in conjunction with selection criteria, the query results could be affected by the order in which processing takes place. In these instances, it is better to perform the query in separate steps so that you can precisely specify the results you are looking for. See Chapter 4 (Ask) for details.

Another user has since changed... In a coediting session, your ability to undo a transaction is subject to the changes other users have been making to the table. For example, suppose you make a change to a record for Acme Hardware. You then decide to change it back to its original value. However, in the meantime, another user modifies or even deletes the record. Under such circumstances, you will not be able to undo your change. See the section on Coediting in Chapter 9 (Modify) for details.

AS must be followed by the name for the field in the Answer The AS operator is used to explicitly name fields in the *answer* table. You must follow AS by the name you want to give to the field. See Chapter 4 (Ask) for details.

Calc expression has a type error In a query form, you have specified an expression which cannot be processed because one or more elements of the expression have incompatible types. For instance, you cannot add a number to an alphanumeric value. See Chapter 4 (Ask) for more details.

Cannot append to previous line In the report generator or script editor, pressing [Backspace] with the cursor at the beginning of a line of text will force the line to be appended to the end of the line above. This error indicates that there is not sufficient room for this operation.

Cannot change CHANGED table In a query, you cannot use the Changeto operator to change records in the temporary *changed* table. Rename the *changed* table first and then respecify the query.

Cannot delete from the DELETED table In a query, you cannot use the Delete operator to remove records from the temporary *deleted* table. Rename the *deleted* table first and then respecify the query.

Cannot delete master record while detail records depend on it In a linked multitable form, Paradox will not let you delete a master record if there are detail records that are linked to it. This preserves *referential integrity*; otherwise, you could have (for example) orders placed by a non-existent customer. You must first delete all associated detail records before deleting the master.

Cannot get private directory, trying current directory The private directory that has been specified in your PARADOX.CFG file either does not exist, is in use by another user on the network, or is unavailable to you because you do not have sufficient network privileges to it. In this case, Paradox will attempt to make the directory from which you started Paradox your private directory. You should consult your network administrator to make sure that your PARADOX.CFG file and your network path have been properly specified. See the *Network Administrator's Guide* for details.

Cannot insert into the INSERTED table In a query, you cannot use the Insert operator to insert new records into the temporary *inserted* table. Rename the *inserted* table first and then respecify the query.

Cannot place duplicated area on top of fields placed on the form In a multirecord form, all of the fields must be placed in the area that serves as the model for duplicating records. This area itself cannot contain or be placed on top of any actual fields or literals. See Chapter xx of *Presenting Paradox Data* for details.

Cannot place fields or literals in the duplicated area of a multirecord form In a multirecord form, all of the fields must be placed in the area that serves as the model for duplicating records. This area itself cannot contain or be placed on top of any actual fields or literals. See Chapter xx of *Presenting Paradox Data* for details.

Cannot record during script play You cannot begin to record a new script while an existing script is being played. Cancel playing the existing script before starting to record the new one.

Cannot split field during resize In a report specification, you cannot resize a column if that operation would split a field value. Move the cursor so it is not within the range of the field before attempting to resize the column.

Cannot toggle to linked form... You have started to edit or coedit a table, you cannot toggle to a multitable form without first ending the edit or coedit session. In addition, if there are multiple images of a table on the workspace, the duplicate images must be removed before toggling to a multitable form. These rules are enforced to ensure data integrity and consistency. For similar reasons, if you start to edit or coedit through a multitable form, you cannot make changes to the tables included on the form in any other context without first ending the edit or coedit session.

Cannot use LIKE with patterns. Use patterns for exact matches only In a query, the *like* operator can only be used with precise literals or example elements. Conditions of the form *like..s..n* in general do not make sense. See Chapter 4 (Ask) for more information on Queries.

Can't access...script On a network, you can't play a script that another user is editing, or edit a script that another user is playing. Wait and try the operation later.

Can't start Paradox: file parameter in CONFIG.SYS too low In order to run Paradox, the DOS file *config.sys* must specify the parameter *Files = 20*. *Config.sys* is automatically placed on your hard disk or working System Disk when you install Paradox. If you get this message, it means that either *config.sys* was not present or available on your root directory when you booted your system, or it is present but contains an incorrect *Files* parameter. See Chapter 16 (Advanced Topics) for more details.

Can't start Paradox: not enough memory You have less than 512K of random access memory (RAM) available on your computer. You can increase the available memory by removing any RAM-resident programs or a RAM-disk, or by installing additional memory chips or boards.

Can't start Paradox: total number of authorized users has been reached When it is used on a network, Paradox automatically keeps track of the number of users who are working with the program. The number of simultaneous users is limited by the number of "counts" purchased and authorized by the license agreement. If the maximum number of authorized users has been reached, you won't be able to start Paradox until one of the current users finishes his or her Paradox session.

Delete files if possible but NOT ACTIVE PARADOX OBJECTS OR .LCK FILES When you cannot continue an operation because you have run out of disk space, Paradox gives you the opportunity to free some space by temporarily exiting to DOS so you can delete files. You should delete as many files as possible during this process, but you must not delete any files containing active Paradox objects (files with .DB, .F*n*, .R*n*, .G, .PX, .X*nn*, or .Y*nn* extensions) or Paradox network locks (with .LCK extensions). You may also see some temporary Paradox files that you should not delete; these often start with names like "ZZZ" or "ZXZZ". In addition, you must not delete any of the Paradox system files (files with the name PARADOX3. See Chapter 14 (Advanced Topics) for further details.

Detail table cannot be edited when corresponding master record is blank In a linked multitable form, Paradox will not let you enter or change detail records if the current master record has a blank link key. This preserves *referential integrity*; otherwise, you could have (for example) orders placed by a non-existent customer. You must first establish the identity of the master record before working with its associated details.

Does not conform to PAL picture rules When specifying a picture in a validity check, the picture must follow the conventions established for pictures in PAL—the Paradox Application Language. See Chapter 5 of the *PAL User's Guide* for details about specifying pictures.

Drive not ready Paradox is attempting to read or write from a disk you have specified, but cannot do so because the drive door is open, a disk is not inserted in the drive, or the drive does not exist.

Duplicate field name encountered When creating or restructuring a table, each field must have a unique name. Change one of the duplicate names before continuing.

Embedded form must have all non-linking key fields placed on it To maintain data integrity, if you are linking a detail table to a master on a multitable form, all of the key fields of the detail must either be included in the link key of the form or must explicitly be placed on the detail form itself. To correct this problem you need to either restructure the detail table or change the form.

Expression in this field has the wrong type You have specified an expression in a field of query form that conflicts with the designated field type for that field.

Fields in Find rows cannot be checked In a Find query, the rows containing the specification of the value or values to be found cannot contain checkmarks. Remove the checkmarks before proceeding. See Chapter 4 (Ask) for more information on Find queries.

Find can be used in only one query form at a time In a query statement, only one query form can contain the *find* operator. See Chapter 4 (Ask) for more information on queries.

Find cannot be used with the ANSWER table You cannot use the *find* operator in a query involving the temporary *answer* table. See Chapter 4 (Ask) for more on queries.

First field of lookup table is not of the appropriate type When you specify a lookup table, the field which contains the lookup values must be compatible with the field that will be checked. See Chapter 9 (Modify) for more on validity checking.

INSERT can be used in only one query form at a time You cannot use the *insert* operator in more than one query form at a time. To do insertions in multiple tables, you must do sequential queries. See Chapter 4 (Ask) for more information on Insert queries.

Insert, Delete and Changeto rows may not be checkmarked You cannot use a checkmark in a query form containing an *insert, delete,* or *changeto* operator. Remove either the operator or the checkmarks before proceeding. See Chapter 4 (Ask) for more on queries.

Insufficient disk space for export Paradox has determined that it cannot Export the data in a table because there is not enough room on the disk or directory you have designated to hold the exported version of the data. Change your working directory or floppy disk (after pressing Clear All [Alt][F8]), or delete some files before continuing.

Insufficient disk space to insert new records Paradox has determined that there is not enough room on the designated disk to complete an Insert query. Change your working directory or floppy disk (after pressing Clear All [Alt][F8]), or delete some files before continuing.

Insufficient memory for... Paradox has determined that it does not have enough memory available to carry out the operation you have specified. Before continuing, end the current operation and try to increase available memory by clearing the workspace. You can also increase memory by removing any RAM-resident programs you may have installed on your computer. See Chapter 17 (Troubleshooting) for more details.

Insufficient rights for... The owner of the table has restricted access rights to it by establishing one or more **auxiliary passwords**. The password you have presented does not grant you sufficient access rights to the table to perform the operation you've specified. At this point there are two courses of action: if you know a password to the table that provides a higher level of access, use **Tools/More/Protect/Clearpasswords** to clear all existing passwords, then give the more powerful password when you are next challenged for one; or, see the owner of the table. See Chapter 12 (Tools) for details.

Key exists—press [Alt][L] to confirm or [Alt][K] to see existing record When you are coediting a keyed table, if you enter or change a key value to match an already-existing key value in another record, you will cause a *key violation.* This means that two records have the same identifier. In this situation, if you press [Alt][L], you will cause Paradox to replace the existing non-key values with the new ones you've just entered. You can see the existing values by pressing [Alt][K]. If you want to cancel your changes, simply press Undo [Ctrl][U].

...locked by PARADOX.NET in...(your PARADOX.NET is in...) The PARADOX.NET file is a special control file that coordinates all Paradox activity on a network. Each network should have one and only one PARADOX.NET file; when Paradox is installed, a parameter is set that indicates the location of the directory in which this file resides. Paradox tables and other objects cannot be shared by workstations pointing to different PARADOX.NET files; therefore if there are two or more PARADOX.NET files on a single network, some users may be precluded from having free access to all objects. You'll see this message if a user on a workstation pointing to a .NET file different than the one you are pointing to has locked an object that you are trying to access. You should see your network administrator for assistance in resolving this problem.

Lookup table cannot have more than one key when fill-in is requested You can use **ValCheck/Define/TableLookup** to set up a validity check that automatically fills in values from one table to another (see Chapter 9 (Modify) for details). When you do this, the lookup table may be keyed to improve performance; however, only the **first field** of the table may be included in the key. If the table you want to use as a lookup table has a concatenated (multi-field) key, you'll have to restructure the table to eliminate the additional key fields.

Maximum report width would be exceeded by another page-width Reports cannot be wider than 2000 characters. Adding another page-width would exceed this maximum.

Must be in Main mode or Graph mode to graph a table If you are editing or coediting a table, you must first end the edit session before being able to create a graph.

Name may not contain a file extension With a few exceptions, it is not necessary to specify file extensions to Paradox. Remove the extension before continuing.

New type specified for... isn't compatible with old type During the restructuring of a table, you have changed the type of a field to one that is not compatible with the old type. This could happen if you try to change a $ (currency) field to a **D** (date) field, for example. See Chapter 2 (Fundamentals) for more information on field types.

No speedup possible You have asked Paradox to create a QuerySpeedup file (secondary index) for a query statement. After assessing the situation, Paradox has determined that setting up a QuerySpeedup would not improve performance of the query.

No such field as[...] In calculated fields in a form or a report, you can designate fields in expressions by enclosing the field name in brackets. The field name you have provided does not exist.

No field type specified for... When creating or restructuring a table, you must designate a field type for each field. See Chapters 8 (Create) and 9 (Modify) for more information about creating and restructuring tables.

Non-consecutive key found for... You may designate one or more key fields in a table. The keys must be grouped together at the beginning of the table structure and must be consecutive. See Chapter 8 (Create) for more information on key fields.

Not enough disk space to... Paradox has determined that there is not sufficient room on the current disk or working directory to carry out an operation. You can either change your working directory, or (if you are using a dual-floppy system) change floppy disks after pressing Clear All [Alt][F8]. See Chapter 17 (Troubleshooting) for more details.

Not enough memory to... Messages of this form indicate that Paradox has determined that it will not have enough memory available to complete an operation you have designated. You should complete the current operation and attempt to increase the amount of available memory by clearing the workspace. You can also increase memory by removing any RAM-resident programs you have installed on your computer. See Chapter 17 (Troubleshooting) for more information.

Not enough memory to show directory list There is not enough memory to display the list of tables, scripts or other files that is usually provided on the second line of the menu. You can attempt to increase available memory by clearing the workspace. You may also need to decrease the number of files on the current disk or directory.

Not enough space to add ENTRY records...Saving ENTRY table instead There is not enough room on your current disk or directory to add the records from the temporary *entry* table to the permanent table you want to add records to. Paradox will attempt to save the *entry* table itself. Change your working directory or floppy disk before continuing. If Paradox was successful in saving the *entry* table, you can combine its records with the permanent table by selecting **Tools/More/Add** from the Main menu.

Obsolete form After restructuring a table, you cannot use a form that was not also restructured in the process. This can happen if you copy Paradox objects, such as tables or forms, to a different disk or directory by using the DOS *copy* command rather than by using the **Tools/Copy** selection from the Paradox Main menu.

One or more query rows do not contribute to the answer You have specified selection criteria in a query form that Paradox cannot connect with another part of the query statement. You must add example elements to indicate links. See Chapter 4 (Ask) for more on queries.

Press ↵ to end field view You must press [Enter] to end a field view operation and continue viewing or editing a table.

Printer not ready You have told Paradox to print a report, but your printer is not on, or is not connected or available. After you turn the printer on, you must again request the report to be printed.

Query appears to ask two unrelated questions A query statement does not make sense to Paradox because it appears to be asking two or more unrelated questions at the same time. This may happen if you have a query statement on more than one row in which the checkmarks are not congruent, or if you have a query form at the top of the workspace left over from a previous query. See Chapter 4 (Ask) for more details.

Record exceeds maximum size You are attempting to create a table with a record size of greater than 4,000 bytes. It is not a good idea to create tables with records as long as this in any event; you should try to create several tables with relatively few fields. Reduce the size of the record, and see Chapter 8 (Create) for more details.

Record exceeds maximum size for keyed table You are attempting to create a keyed table with a record size of greater than 1,350 bytes. It is not a good idea to create tables with records as long as this in any event; you should try to create several tables with relatively few fields. Reduce the size of the record, and see Chapter 8 (Create) for more details.

Requested form is obsolete You'll most often get this message if you attempt to use Form Toggle [F7] or **Image/Pickform** to view a form that has been not been properly updated when a table has been restructured. For example, you'll get this message if you make a copy of a table, then restructure it and attempt to toggle to the original form. You'll may also see this message if you attempt to rename a .F file through DOS.

Something wrong with field value syntax... You have entered a value into a field that conflicts with the field type or format that has been established for the field. The format may be established through the Image menu or through a validity check file. One example of this sort of error would be a number such as *34,34,000.00.* Carefully check the field value before continuing.

Table and index based on different sort orders (delete .PX file at DOS level) You are using a keyed table whose index was generated at a time when a different sort order was in effect for Paradox. If you change the sort order, all .PX files are obsoleted. At this point, if you want to use the table, there are two things you can do: 1) delete all .PX files through DOS and then rebuild them as needed by using **Restructure**; 2) change the current sort order back to the one that was in effect when the table was created by using a different PARADOX2.SOR file. See Chapter 16 (Advanced Topics) for details.

Table being edited using a linked form; make changes using that form On a network, if one user is making changes to a table through a multitable form, all other users must use the same multitable form to coedit the table. This rule is designed to preserve referential integrity. If you see this message, you can use the **Tools/Info/Lock** selection to determine who on the network is editing the table, and then ask which form is being used.

Table is corrupted The data in the table you are trying to use has been corrupted. You will not be able to use it without reconstructing it. See Chapter 17 (Troubleshooting) for more details.

Table is indexed, but index is out of date (delete .PX file at DOS level) You may be using an indexed table created in a prior release of Paradox. In order to use the table, you must go into DOS and delete the primary index file for the table. You can then use **Restructure** to regenerate the index.

Table is indexed, but .PX file is not present You have established an index for a table by indicating a key field, but the index file is missing. This could happen if you have copied the table through the DOS *copy* command instead of using the **Tools/Copy** selection from the Paradox Main menu.

Unable to find configuration file containing printer drivers To print a graph, you must have used the Custom Configuration Program to create a PARADOX3.CFG file that specifies the correct printer driver for your graphics printer. You may have deleted this file or you may need to make sure your DOS path is correct. See Chapter 14 (Advanced Topics) for details. Configuration and path issues are especially important on a network; if you are working on a network and you see this message, contact your network administrator for assistance.

Unable to find proper screen driver needed to display graph To display a graph on the screen, a special file called a *screen driver* must be present in the directory containing the Paradox system files. These drivers have the .BGI extension. If you see this message, it is possible that Paradox was not installed correctly, or that your DOS path must be changed. Installation or path problems can also cause this condition on a network; if you are working on a network, see your network administrator for assistance.

Unable to find specified font file Separate font files are needed to display different type styles for titles in Paradox graphs. These files have the .CHR extension. If you see this message, it is possible that Paradox was not installed correctly, or that your DOS path must be changed. Installation or path problems can also cause this condition on a network; if you are working on a network, see your network administrator for assistance.

Unexpected condition... Paradox has encountered an unexpected condition in which it cannot continue to operate. For example, the number of files DOS allows in a directory has been exceeded. In such cases, an exit to DOS will occur. See Chapter 17 (Troubleshooting) for more details.

Warning! Table may be damaged! (any key to continue) Paradox has detected that the data in a table may be corrupted. You may not be able to use the table without reconstructing it. See Chapter 17 (Troubleshooting) for more details.

Glossary

Alphanumeric field A field containing letters and/or numbers and special characters.

Ascending Order When you sort records in ascending sequence, alphanumeric values are arranged in their **sort order**. Numeric values are sorted from low to high, and date values form earliest to latest. *See also* Ascii; Descending Order; Sort.

Ascii An acronym for American Standard Code for Information Interchange; a sequence of 128 standard characters, letters, numbers, and symbols. The IBM PC extends this code to include 128 additional special characters. *See* IBM extended characters *and Appendix C of the* PAL User's Guide *for a complete list of IBM Ascii codes.*

Asymmetrical outer join A query in which an inclusive link in specified for only one of the tables involved. See also Inclusion operator; Inclusive link; Outer join.

Automatic lock *See* Lock.

Autorefresh The process by which table images on your screen are automatically updated at a set interval to reflect changes made by other users on a network. *See also* Refresh.

Auxiliary password A password set by the "owner" of a table that confers limited rights to work with the table, its fields, and its family. *See* Password *and* Owner password.

Axis The horizontal or vertical line that defines the range of values plotted on a graph. The X axis is the horizontal line which often measures categories, like sales divisions or time. The Y axis is the vertical line which generally measures values. Except for pie charts, all Paradox graphs are plotted along X and Y axes.

Band A horizontal section of a report specification governing the placement of elements in the report. The report specification shows these strips with **band indicators** for the **page**, the **report**, **groups** within the report, and the **table** or **form**. So, for example, the *page band* shows information that will appear on every page, the *report band* controls what is printed before and after the report, and so on.

Blank field A field that does not contain a value.

BLANKLINE A keyword used in a report specification to maintain an empty line that word-wrapped fields might otherwise occupy. *See also* Word wrap.

Borrow To copy all or part of the structure of one table for use in a new one.

Calc operators When performing queries, the *calc* operators are used to calculate the count, sum, average, maximum, or minimum values of a particular field. *See also* Comparison operators.

Calculated field A field containing values calculated using one or more other fields. The calculation is based on an expression that tells Paradox what to do with the values provided. *See also* Expression.

Cancel A menu selection that stops whatever is in progress and returns you to the main workspace. *See also* Undo.

Character Any number, letter, or other symbol that appears on the workspace. *See also* Ascii.

Checkmark The symbol used in query statements to indicate that a field is to be displayed in the *answer* table.

Coedit To edit a table concurrently with other users on a network.

Color palette *See* Palette

Column **In tables**, each field makes up one column. Columns are composed of fields of the same type, and are usually given a name that is descriptive of their content, such as *City* for an alphanumeric field containing city names, or *Amount* for a dollar field containing a bill total. *See also* Field Type; Record; Row. **In tabular reports**, a column is a structured vertical segment of the report specification that can be either a table column containing field values, or a specially created column containing calculated values or literals.

Column labels The field names listed across the top of a crosstab table. You select the field whose values will become the column labels. That field must be to the right of the row labels field.

Comparison operators When you perform a query, you may ask Paradox to compare two field values using the comparison operators <, <=, etc. *See also* Calc operators.

Concatenated key A key made up of two or more fields in a table. *See* Key field.

Configure To customize Paradox for your machine and printer combination and set Paradox's default values.

Constant A specific, unchanging value used in calculations, such as the *1.06* in the formula *calc 1.06 * [price].*

[Ctrl][Break] A key sequence that stops the current task and returns you to the previous operation.

Crosstab A table in which data from the normalized form of a relational database are converted to a spreadsheet-like structure. It summarizes the data in one field by expressing it in terms of two other fields. See also row labels; column labels.

Current Used in conjunction with **drive** or **directory**, as in *current directory*, specifies the working disk drive and disk location for Paradox files. Used in conjunction with **fields**, **images**, **records**, and **tables**, as in *current field*, specifies the cursor's position on the Paradox workspace.

Cursor A blinking underline or bright box that marks your location on the workspace or points to where your next action will take effect.

Cursor control keys The keys at the far right of the keyboard with numbers and arrows on them. These keys are used to position the cursor on the workspace. The same area is sometimes called the **numeric keypad** because it is also used to enter numbers.

Data A group of facts; in Paradox, the contents of individual fields and records in a table.

Database An organized collection of information.

Data consistency The assurance that the values in a table image you are viewing or coediting actually exist together in the table at one time and are consistent with other users' images of the table. This can be problematic on a network when several users are making changes to the table at once.

Data integrity The assurance that the values in a table are protected from corruption. This can be problematic on a network, for example, when one user tries to open a file that another has already opened.

Date field A field that can contain only dates.

Debug The process of interactively correcting a PAL program.

Debugger A built-in PAL facility that allows you to test and debug your programs. *See also* Scripts.

Decimal separator In a number, the character (“.” or “,” depending on format) that separates whole digits from decimal digits. *See also* International numeric format; Whole digit separator.

Default A standard value that a field will contain unless you enter something else; including, **in reports**, the settings that will be used for printer control, page control, and so on unless you specify otherwise.

Delimiter A character (default“) used to surround fields in an Ascii file. *See also* Separator.

Descending order When you sort records in descending order, **alphanumeric** values are arranged in reverse Ascii sequence, **numeric** values from high to low, and **date** values from latest to earliest. *See also* Ascending Order; Ascii.

Detail table In multitable forms and reports, a table whose fields are embedded in the form or report for the master table, and whose records are “owned” by master records.

Directory A DOS disk specification. *See also* Working directory; Object.

Display only field In the design of a form, specifies a field that can be viewed but **not changed**. A display only field will show whatever information is stored in the related regular field. *See also* Regular field.

Edit The process of changing the information contained in tables, or changing a PAL program. *See also* Coedit; Script Editor.

Editing tables The process of entering new information in a table or changing existing information.

Editor *See* Script Editor.

Embedded form A form for one table that appears on the form for another.

Encrypt To translate a table or script into code that cannot be read without presenting the proper password.

Example element In a query, a set of characters shown in reverse video specifying how rows from one table should be linked to rows in another.

Exclusive link In a query, the use of an example element to retrieve from one table only those records which match the records in another table. See also Exclusive link.

Explicit lock *See* Lock.

Export To send Paradox information to a file in a form that can be used by another program. *See also* Import.

Expression In reports, a group of characters and operators that represent a quantity or value. For example, the expression *[Rate] * [Time]* will multiply the value in the Rate field by the value in the Time field. **In query forms**, a group of characters and operators that together specify how Paradox is to retrieve information.

Family A Paradox table and its set of related objects, such as forms, reports, and indexes. *See also* Object.

Family lock A lock that keeps other users on a network from changing objects in the family of a table.

Field A single element in a record. *See also* Column; Record; Table.

Field edit To use Field View [Alt][F5] or [Ctrl][F] to edit a field value or response to a prompt.

Field type The kind of information that a column contains, such as **alphanumeric**, **date**, **currency**, or **numeric**.

Field value The specific data contained in a field. *See also* Field Type.

Field View [Alt][F5] or [Ctrl][F] to move the cursor within a field to view or edit its value.

File A collection of information stored under one name on a disk. May refer to Paradox objects such as tables, scripts, image settings, and QuerySpeedup files; or to DOS files created by products other than Paradox.

Format The way information is arranged on a screen or printed.

Form view A way of looking at data on the workspace in which information is displayed one record at a time according to your specifications. Pressing Form Toggle [F7] switches between a table view and a form view of records. *See also* Table view.

Full lock A lock that gives you exclusive use of a table on a network.

Function keys The ten keys at the far left of the keyboard labelled [F1] through [F10]. These keys are used to provide fast access to Paradox operations.

Grid Lines drawn across a graph at each tick mark to make it easier to identify the position of graph elements.

Group In a report, a set of records that have (a) the same value in one or more fields, (b) fall within a range of values, or (c) are grouped into a fixed number of records. Groups are sorted according to whatever group criteria you establish.

Group band A horizontal section of the report specification that controls groupings of records in the report. *See also* Band; Group.

Groupby operator In a query, you use Groupby [Shift][F6] to tell Paradox to group records by that field without displaying its values in answer.

Help screen A presentation of information on the workspace regarding a specific part of the program. Help screens are what you see when you press Help [F1].

Highlight A method of emphasizing words or images on the workspace by showing characters black-on-light rather than the normal light-on-black.

IBM extended characters A set of 128 special characters, including accented and Greek letters and graphics, that extend the standard Ascii character set on IBM personal computers and compatibles. *See* Ascii *and Appendix C of the* PAL User's Guide *for a complete list of IBM Ascii codes.*

Image A view of a table on the workspace. It can be either a **table view** or a **form view**. There can be several images on the workspace at the same time. You can control how table views are displayed by selecting **Image** from the Main menu. Form views are controlled through **Forms** on the Main menu.

Import To bring information contained in files created by other programs into a Paradox table. *See also* Export.

Inclusive link A query whose answer includes all the values in a field of one table whether or not there are matching values in the linked field of another table. See also Inclusion operator; Outer join.

Inclusion operator The symbol !, which is used in conjunction with an example element to include a complete set of records in the answer to a query, whether or not they match records in another table. See also Inclusive link; Outer join.

Index A reference to a table that Paradox can use to locate records more rapidly. *See also* Primary index; QuerySpeedup file.

Insert mode During editing, pressing [Ins] switches between inserting characters and replacing (overwriting) characters. In insert mode, characters are placed at the cursor and push aside characters that are already there. In replace mode, characters overwrite what is already on the screen as the cursor moves over them.

Installation The process of copying and preparing Paradox for operation on a hard disk or two floppy disk microcomputer system or on a computer network.

Instant report A report that will be printed out—using the default report specification, **R**—when you press the Instant Report [Alt][F4].

Instant script When you press Quick Script Record [Alt][F3], Paradox will begin recording your keystrokes and place them in a quick script field named *Instant* for later playback using Quick Script Play [Alt][F4].

International numeric format In numbers, the use of "." as whole digit separators and "," as the decimal separator, such as 1.234,56.

JustFamily A copy operation that applies to all objects in a table's family except the table itself.

Justify In a report, to align a value within a field.

Key field One or more fields in a Paradox table used to identify records. Having key fields in a table assures that it will not contain duplicate records. Records are maintained in their sorted order based on their key fields, and a primary index for the table is created from the key fields, making retrieval of records much faster.

Label The text or numeric information placed near the tick marks to represent values on the axes of graphs.

Legend Text which may appear alongside a graph to identify each series of data.

Link A logical association between tables based on the values in corresponding fields. See also Exclusive link; Inclusive link; Link key; Lookup table.

Link key In a linked multitable form, the part of the detail table's key that is linked or matched to fields in the master table.

Link lock Once you begin editing or coediting linked tables through a multitable form Paradox places a link lock on them, which prevents their being edited except through the form for the rest of the current edit or coedit session.

Literal In form and report design, any character typed directly onto the screen that will show up in the final result just as it is.

Lock A device that prevents other users on a network from viewing, changing, or locking a table, record, or family. Paradox locks objects automatically to provide maximum concurrent access while still maintaining data integrity and consistency. You can also lock objects explicitly. *See also* Full lock, Write lock, Prevent full lock, Prevent write lock, Record lock, *and* Family lock.

Lookup table A table whose first or key fields are linked to fields in a master table. In a validity check, a lookup table is a way of assuring that a value entered is represented by a record in another table. In report and form design, fields from linked lookup tables can be placed on the report or form as if they were fields in the master table. See also Link; Master Table.

Main menu The first set of selections to appear on the top line of the screen at the beginning of a Paradox session.

Many-to-many In a linked multitable form, a many-to-many relationship specifies that each master record is one of several master records that can be linked to several detail records.

Many-to-one In a linked multitable form, a many-to-one relationship specifies that each master record may be one of several master records that are linked to a single detail record.

Mask A symbolic picture of a field, such as 9999 or AAAAAAAA, that shows the field's position, type, and format in a report.

Master form In form design, a form created for a master table which has forms for detail tables embedded in it.

Master table In report and form design, the table to which the form or report is associated and on which other detail or lookup tables can be placed or linked.

Menu A list of selections at the top of the screen. You make your choice by using the arrow keys to highlight the desired selection, or by pressing their initial letter keys.

Message window The area at the bottom right of the screen where help messages are displayed.

Mode The current Paradox state. Paradox may be in any one of the following modes: Main, Edit, Coedit, Restructure, Sort, Form, Report, Create, DataEntry, Password, or Script. The mode is shown at the right of the menu line (top line of the screen).

Multirecord form A form which displays more than one record from a table at a time. A multirecord form can be embedded in a multitable form.

Multirecord region The area on a multirecord form which contains all of the fields, borders, and text for one record. This region is then copied into a repeating area.

Multitable form A form which includes fields from more than one table. See also Detail table; Master table.

Natural size In form design, the size of the form for a detail table which is to be embedded in the master table's form. It is determined by the extent of the form from the upper left corner to the lowest and furthest left character or field placed on the form.

Network administrator The person responsible for managing a local computer network. Generally has control over network access and backup.

Normalization An arrangement of data in tables so that the data in different tables can be easily related.

Number field A field that can contain only numbers, a sign, and a decimal point.

Object A table, form, report, script, index, image setting file, or validity check file in a Paradox database. A table and its related Paradox objects make up a family. *See also* Family.

One-to-many In a linked multitable form, a one-to-many relationship between records in the master and detail tables specifies that each master record is linked to a group of detail records. No other master record matches that group of detail records.

One-to-one In a linked multitable form, a one-to-one relationship between records in the master and detail tables specifies that each master record is linked to only one detail record. No other master record matches that detail record.

Operators An operator defines an operation to be performed on a value or values. Operators may define a) a relationship, such as >= or *like* in a query; b) an arithmetic calculation, such as + or *sum* in a *calc* formula; or c) commands, such as *find* or *changeto* in a query.

Outer join A type of query which uses the inclusion operator (!) to retrieve all of the records in a table, whether or not they match records in another table.

Owner password A password set by the "owner" of a table that confers full rights to work with the table, its fields, and its family. *See* Password *and* Auxiliary password.

PAGEBREAK A keyword used in a report specification to start a new page at a given point.

PAL Paradox Application Language

Palette The display of foreground and background colors from which you can select new colors for Paradox screen elements. In the Form Designer, the palette can appear automatically, or you can turn it on or off using [Alt][C]. Color palettes are also used in the Graph Designer and the Custom Configuration Program.

Password A set of characters that must be given to Paradox before a password-protected table or script may be used.

Pattern A model for value, such as *M*.. (names that begin with *M*), *S@@@@@n* (seven-letter names that begin with *S* and end with *n*), or *12/../..* (dates in December).

Picture A pattern of characters that defines what may be typed into a field during editing or data entry. Any data entered in a field containing a picture must match the form of the picture or Paradox will refuse to accept it.

Prevent full lock A lock that prevents other users on a network from placing a full lock on a table. *See* Full lock.

Pointers In report design, the designation - which appears on the menu of fields to place, indicating linked lookup table fields which can be included in the form.

Prevent write lock A lock that prevents other users on a network from placing a full or write lock on a table. *See* Write lock.

Primary index An index on key fields used to determine the location and order of records in a Paradox table.

Printer port A computer's connection to a printer. In DOS, the names of printer ports include LPT1, LPT2, LPT3, COM1, and COM2.

Private directory A personal directory where your own *answer* tables and other Paradox objects are stored so that they will not conflict with those of other users on the network. *See also* Shared directory.

Prompt A message in the menu area that explains what the current highlighted menu choice will do, or what activity or input is expected next.

Protect *See* Password; Write protect.

Protection Generator A tool for generating and implementing multi-level password protection of tables on a network or in a multiuser application. *See the* Network Administrator's Guide *for details.*

Query A question you ask about the data stored in Paradox tables.

Query by example The process of asking questions about information in a table by providing an example of the answer you are looking for.

Query form A form that appears on the workspace when you want to ask questions about a table or tables. You get the information you want by filling in the query form.

Query speedup file A secondary index for a table that lets Paradox locate data in non-key fields quickly. Once created, it is automatically used for subsequent queries if applicable.

Query statement One or more filled-out query forms on the workspace.

Record Each row of a Paradox table is one record. Each record is a group of related fields. *See also* Field; Row.

Record lock A lock that prevents other users on a network from making changes to a record you are coediting.

Record number Each record in a Paradox table is assigned a record number, which always appears in the first column in the table view.

Referential integrity A guarantee of internal consistency in your data even when the data for a single entity is stored in two or more tables.

Refresh The process by which table images on your screen are updated to reflect changes made by other users on a network. *See also* Autorefresh.

Regular field A field that exists in the table. *See also* Calculated field.

Relational database A database designed in accordance with a set of principles called the *relational model*. Information in a relational database must be organized into tables.

Repeating area The area on a multirecord form into which the fields, borders, and text for the first record are copied to represent additional records.

Replace *See* Insert mode.

Report Information from tables printed on paper. A report can also be viewed on the screen prior to printing, or sent to a DOS file.

Report specification A stylized representation on the workspace of how a report is to be printed out on paper.

Restricted view A detail table on a multitable form, linked to the master table on a one-to-one or one-to-many basis, that is limited to showing only those records that match the current master record. See also Detail table; Master table.

Restructure To change the order, field type(s), or key fields of an existing Paradox table.

Row The horizontal component of a table. *See also* Record.

Row labels The values listed down the left side of a crosstab table. The field you choose for the row labels also becomes the crosstab table's key. Any fields to the left of the row labels field are included in the key. See also Column label; Crosstab.

Scale The range of values included in a graph. Also the increment to divide the graph axes into tick marks. See also Tick marks.

Script A stored record of keystrokes or an edited sequence of PAL commands that can be played back at any time to reproduce a result or carry out a series of Paradox actions. *See also* Instant script.

Script Editor A Paradox facility with which you write and change PAL programs.

Scroll To move a table view on the workspace up or down and left or right to see additional records.

Secondary index *See* QuerySpeedup file.

Separator In a number, a character that separates whole digits from decimal digits (see **decimal separator**) or that separates groups of three whole digits. *See* Whole digit separator.

Series Different sets of data displayed on a graph.

Set A specific group of records about which you intend to ask further questions. See also Set comparison operator.

Set comparison operator Reserved words which you use to compare a defined set to other records: only, no, every, and exactly. See also Set.

Shared directory A network directory that contains the tables and other objects you share with other users. *See also* Private directory.

Short number A Paradox field type designating whole numbers (integers). These numbers may only be in the range of +32,767 and -32,767, and may not contain a decimal point.

Snow Speckled interference of the image on the display screen. Snow is caused by the IBM color graphics card and can be eliminated by using the Paradox Custom Configuration Program. *See also* Configure.

Sort To arrange the records in a table based on the values in one or more columns.

Sort order The way in which characters are arranged alphabetically. Paradox supports several different sort orders depending on your country group.

Structure The overall organization of a table that specifies the number of fields it has, the order of the fields, and the field types, including key fields, if any.

Style A Forms menu selection that specifies how text is displayed on a form; bright, reverse video, etc.

Submenu A lower-level menu that appears when you select from a higher-level menu, containing more detailed items that further refine your choice.

Symmetrical outer join A query involving two inclusive links, and which thus includes all records from both linked tables.

Table A structure made up of rows (records) and columns (fields) that contains information.

Table lock A device that prevents other users on a network from viewing, changing, or locking a table. *See* Full lock, Write lock, Prevent full lock, *and* Prevent write lock *for types of table locks.*

Table view A display of information on the workspace in tabular form, with records arranged horizontally and fields vertically. Contrast with a **form view**, which displays records one at a time according to your specifications. Pressing Form Toggle [F7] switches from a table view to a form view. *See also* Form view.

Temporary table A table created by Paradox operations until it is overwritten by another temporary table with the same name, or until you leave Paradox. Temporary tables can be queried and edited just like any other Paradox table.

Text file A DOS file made up of Ascii characters.

Tick marks The markings along a graph axis that divide the axis into segments. Tick marks make the graph easier to read, and convey information about the scale of the graph.

Transformation rules The rules by which Paradox converts the data in a table into a graph.

Undo Reverses changes one by one in Edit and Data Entry.

User name A name that identifies you to other Paradox users on a network.

Validity check A constraint or check placed on values that determines what kind of data may be entered.

Value *See* Field value.

Variable A quantity that may assume different values.

Whole digit separator In a number, the character (“,” or “.” depending on format) that separates groups of three whole digits from each other. *See also* Decimal separator.

Word wrap In a report, an option that breaks an alphanumeric value at a space or hyphen and continues it on the next line if it will not fit on the current one.

Working directory The directory where Paradox objects being worked with are located.

Workspace A metaphorical plane where images of tables, queries, forms, and/or design specifications are placed so they can be worked on. Different parts of the workspace may be brought into view as required. The display screen presents a view onto the workspace below the menu area. *See also* Menu.

Write lock A lock that keeps other users on a network from changing a table in any way or placing a full or write lock on it.

Write protect To lock a table or script so that the information it contains cannot be altered or deleted.

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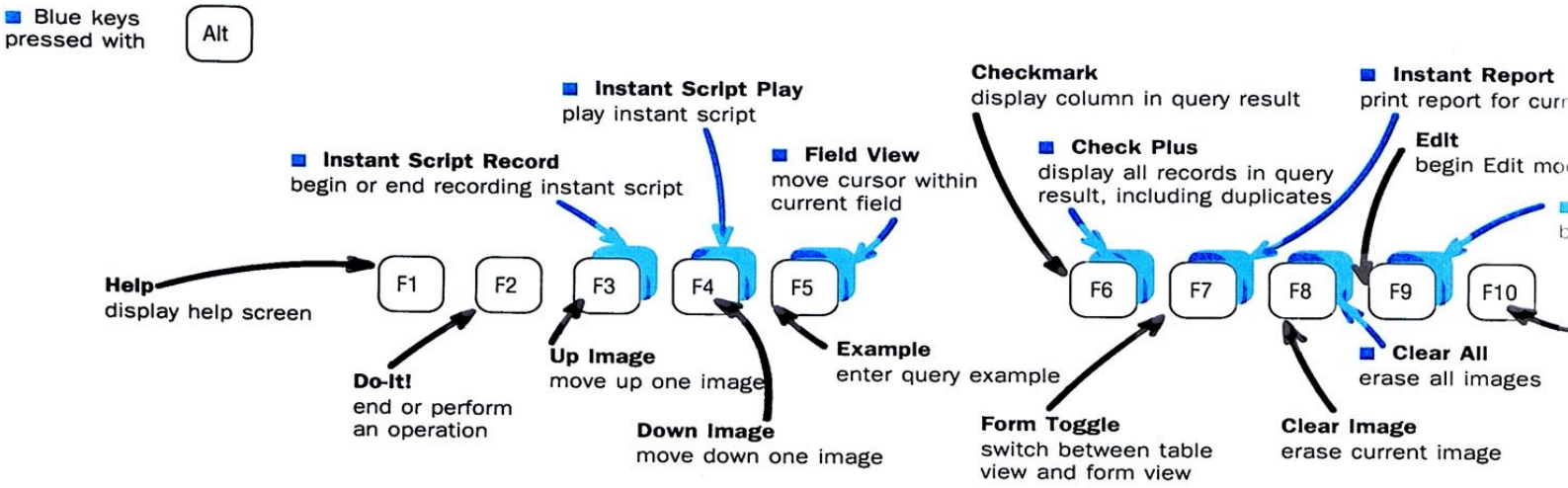
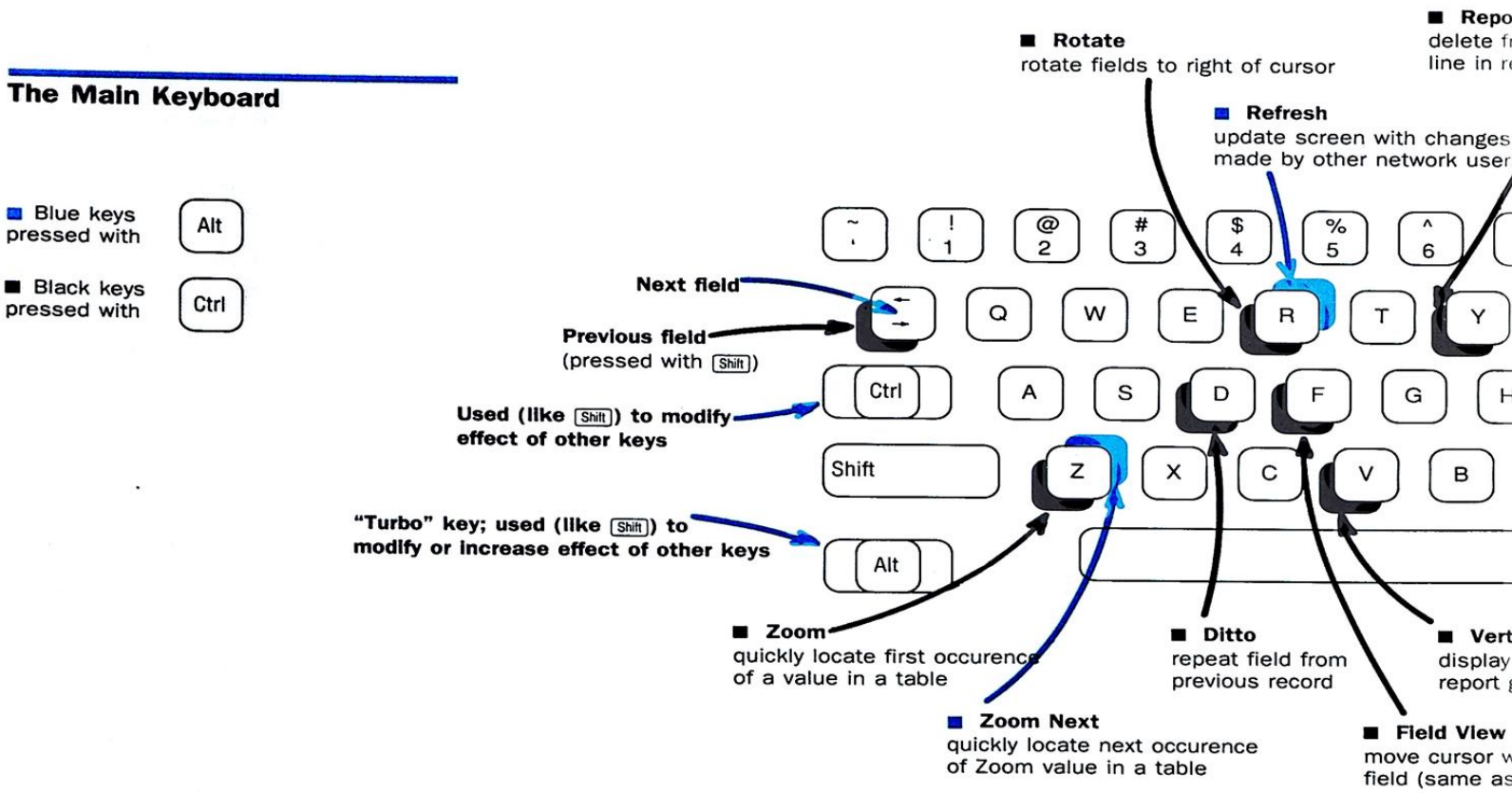
Paradox Function Keys



The Main Keyboard



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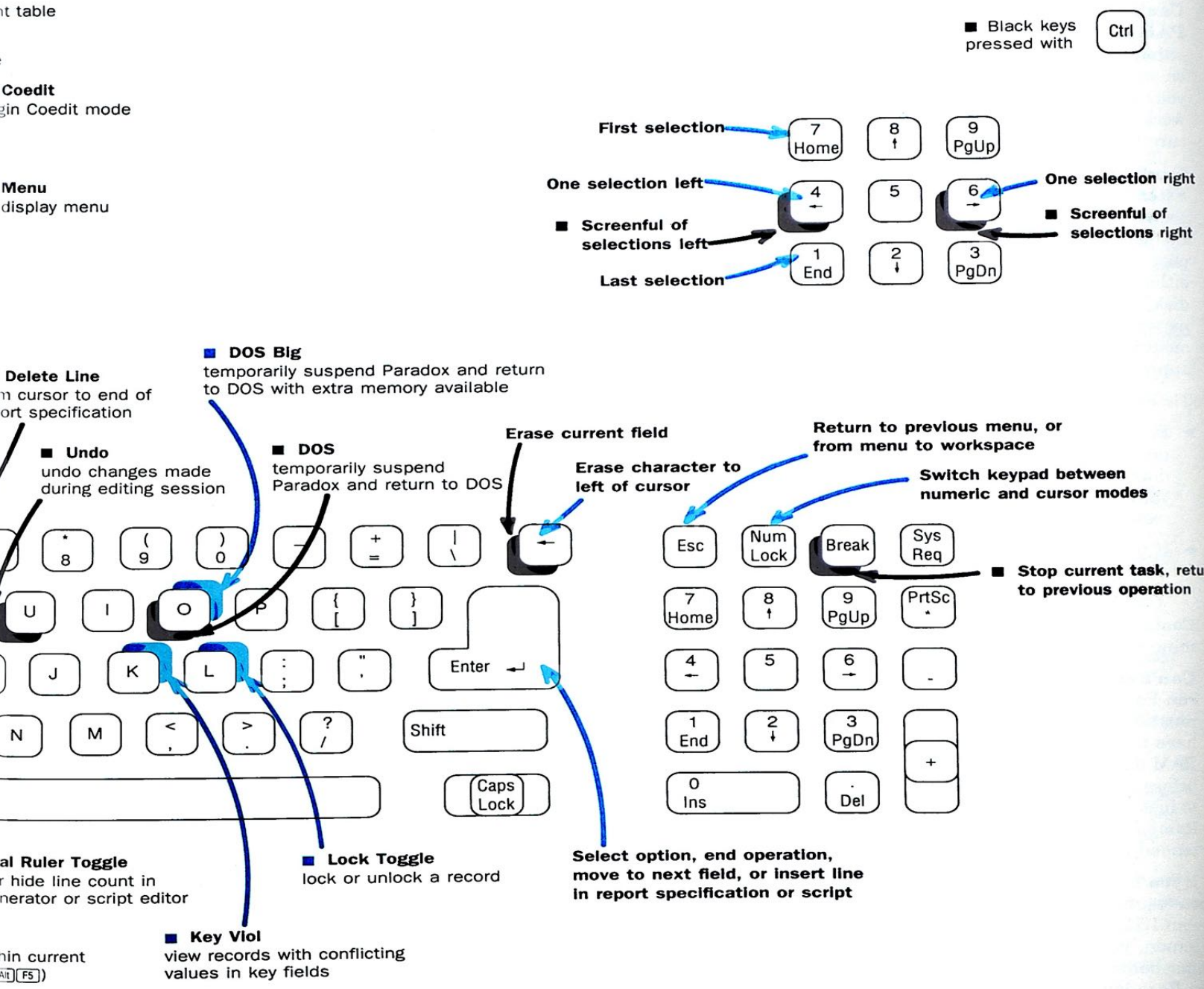

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USER'S GUIDE

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